

UK ELECTRONIC SKILLS FOUNDATION

UNIVERSITY OF
Southampton



CSR

APPLICATION FOR

SCHOLAR OF THE YEAR AWARD 2013

Scholar name:

Ashley J. Robinson

Contact email:

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Sponsoring Company:

Cambridge Silicon Radio (CSR)

University of registration:

University of Southampton

Degree title:

MEng Electronic Engineering with Artificial Intelligence

Submission date

October 9, 2013

1 Introduction

My name is Ashley, an electronic engineering student studying at the University of Southampton. I have been on course to be a practicing engineer from a very young age. At primary school I took an interest in mechanical and civil engineering when we studied great engineers like Robert Stephenson and Isambard Kingdom Brunel but it wasn't until my early teens, when studying for my GCSEs, that I found electronics. Ever since then I have devoted all my working effort towards honing skills and undertaking projects in the field of electronics. Gathering components and tools to continue my work outside of the classroom became my mission. Finally obtaining my own computer, a library of components and some programming knowledge allowed me to begin working with more complex systems where my interest peaked even more. Today I still find it just as exciting working in the lab only now the kit is faster and much more expensive.

I believe I should be considered for the award because my personal contributions to the sponsoring company and to young people possibly entering the field of electronics is exceptional. Working at CSR now for two summers I have managed to produce some valuable results for which team members are grateful (sections 3.1 and 3.2). Leaving a lasting legacy in the form of wiki pages and documentation has allowed my work to be carried on as I continue in my academic career. To inspire younger people to pursue electronics I have organised lectures aimed at sixth form students. Where I have also participated in their studies and distributed electronics hardware from Southampton University. I also promote the discipline less formally to younger friends and family with intentions of moving on to higher education. Always attempting to make myself available to assist with studies or impart any advice.

I am proud to be a UKESF scholar through which I was connected to CSR. I have enjoyed both summer placements and also the workshop event organised in 2012 where we worked on skills not addressed by university. This really emphasises how the scholarship has not only been about connecting with industry but also with other like minded engineers.

2 Supporting information

2.1 Contribution to sponsoring company

I started at CSR in the summer of 2012 and was invited back for a second summer this year. Attached to the digital design team for both summers I managed to leave my mark on their Near Field Communication (NFC) subsystem. For the first summer I ran time based power simulations to generate reports on the efficiency of the NFC design. This was using PrimeTime PX, a power analysis tool from Synopsys and relatively new to the company at the time, I then spent some time documenting my experience of the software to assist other users. The rest of time I spent getting my head around how the company worked; understanding the importance of different tools, their place in ASIC design flow and how people work together efficiently in the industry. Also a crash course in UNIX which has proved most valuable in all my other areas of study. When the second summer arrived I found the job much easier to settle in to as obviously I'd been there before and therefore found myself very busy...

2.1.1 LCD controller

Straight away I was given a task to parametrise a testbench concerned with the driving of LCD glass. An interesting assignment which required competence with mixed signal design to complete. This

project was completed while working with another scholar. I found it easy to work with another engineer at a similar level to me and we managed to complete the task efficiently.

2.1.2 Serial to parallel FPGA design

The requirement was for an interface to test parallel I/O functionality but aimed at the firmware team who use USB to SPI converters to interface with chips. Naturally this called for a block which converts serial traffic to parallel outputs and visa versa. This was manifested as a SPI driven state machine. Frames are sent as pairs of data and address which allows a large parallel interface to be controlled. Controls frames were also used to select read or write operations but the intention was for burst operations to minimise access time. An interesting project which was eventually set for deployment on a Xilinx Spartan-3 FPGA.

2.1.3 NFC verification

This project was assigned to me because of my experience with NFC from my last placement. Turning out to be a big project which consumed around 70% of my time. Emulating the subsystem with a necessary host and analogue front end deployed at PCB level allowed the functionality of the design to be viewed in much the same way as it would on completion. My task was to then write test scripts to run on a leading smart card testing unit. Throughout the course of the project I was able to uncover bugs in the NFC tag state machine. These were corrected and the process iterated until unfortunately the placement came to an end. However before this I managed to setup a testing framework and give a formal presentation on the functionality of the tester to colleagues with the intention of carrying on my work.

2.2 Contribution to encouraging younger people to consider science, technology or engineering for further study and careers

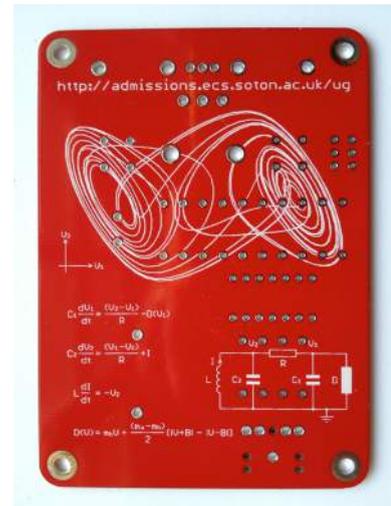
On the 5th of February 2013 I organised several lectures at my previous sixth form college. Alton College is in the same county as Southampton University and many students choose it to further their education. During my time at sixth form I studied electronics and the students now studying this subject were the target audience for these lectures. Two AS classes and one A2 class were running on this day which managed to cover all 42 students studying electronics at the college. The lectures took the form of an initial 10-15 minute presentation about my experience studying towards an electronics degree and my previous summer working in industry. Then I participated in their practical work offering my assistance where possible. Throughout the day I remained in the electronics lab running informal question and answer sessions regarding my presentation or any other question they may have about electronics.

During this time I was heavily involved with my 3rd year project and would meet with my supervisor on a weekly basis. We would spend a lot of the time discussing whatever projects he was currently working on. One such project was a circuit board aimed at distribution to potential students who have visited the university for an interview. The *Chaotic Oscillator*, pictured in figure 1, is an experiment any A-level student should be able to carry out at home with limited tools. The board and all necessary components are provided to the student with directions to online build instructions (Gunn, 2012). Only a soldering iron and solder is required to complete the build. Testing can be done audibly using an in system speaker or because the produced waveform is of low frequency it is possible to use

a sound card oscilloscope connected to the board via a 3.5mm headphone jack (Zeitnitz, 2012). The silkscreen also contains information on the circuit behaviour along with the URL to the University of Southampton's Electronics and Computer Science department undergraduate admissions website. I think this is a great advert for electronics as students will most likely enjoy the build and then find information on an electronics degree starring them in the face! Five of these were handed out at my lectures (the most I could get my hands on) and all the students seemed intrigued by the board.



(a) Populated top



(b) Informative silkscreen on bottom

FIGURE 1: Chaotic oscillator (Gunn, 2012)

3 Details of sponsoring endorsements

3.1 Endorsement I

Name: Farhsid Nowshadi
Affiliation: CSR
Position: Principle Engineer
Email: Farshid.Nowshadi@csr.com
Comments: Fash was my mentor for both placements at CSR. He helped me a great deal throughout, imparting not only technical knowledge but also putting aside his own commitments to organise presentations, tutorials and meetings. This is a quote he gave about my work

We were very pleased when Ashley decided to return to CSR in the summer of 2013. During his time at CSR Ashley worked on several projects centred on our NFC development. Ashley not only completed his tasks on time but added his own creative enhancements and improvement to the original requirements. As a consequence he has made a real contribution to our project. Ashley has a keen mind and a dedication to tackle problems head-on and a relentless determination to resolve issues as they arise. He remains an affable, enthusiastic and motivated engineer. We appreciate his contribution.

3.2 Endorsement II

Name: Paul Hoayun
Affiliation: CSR
Position: Principle Engineer
Email: Paul.Hoayun@csr.com
Comments: I worked with Paul for the beginning of my most recent placement. This is a quote he gave about my work.

When Ashley joined the digital group this summer, the most striking aspect was how quickly he got up to speed with all aspects of the assigned task, such that he was able to contribute almost from the very first day. Although he had no previous experience with LCD controller design and verification, he quickly understood the principles and requirements, and hence was able to produce a range of verification test benches with minimal supervision. I would have no hesitation in recommending Ashley for Scholar of the year

3.3 Endorsement III

Name: David Davenport
Affiliation: Alton College
Position: Electronics co-ordinator
Email: Dave.Davenport@altoncollege.ac.uk
Comments: Dave was my tutor and physics teacher when I studied at Alton college. This is a thank you email he sent to me after my visit.

Ashley

Thank for your splendid presentation, demonstrations, gifts and general support and interaction with our students yesterday. You have fired their interest in studying electronics (and engineering) beyond these walls and thereby motivating them to work hard at their A level studies too!

Your evident enthusiasm for Southampton, the University and the Electronics Faculty that you are working in has certainly inspired several of them to seriously consider Southampton applications in the coming months!

Once again many thanks for your time and energy spent on this excellent days work!

Best of luck with all your exams and plans!

3.4 Endorsement IV

Name: John Stratford
Affiliation: Alton College
Position: Director of Learning
Email: john.stratford@altoncollege.ac.uk
Comments: This is a thank you email John sent to me after my visit

Ashley

Can I also take the opportunity to thank you for your recent visit to the College and the work you did with our students to stimulate their interest in Electronics and for that matter in Southampton University! It was much appreciated by all concerned. Unfortunately, I was out of College on Tuesday and was therefore unable to pop along to see what was going on.

Thanks again.

4 Supporting evidence

4.1 Alton college lecture slides

The slide show is also held in the archive *AltonCollegeSlides.pdf*

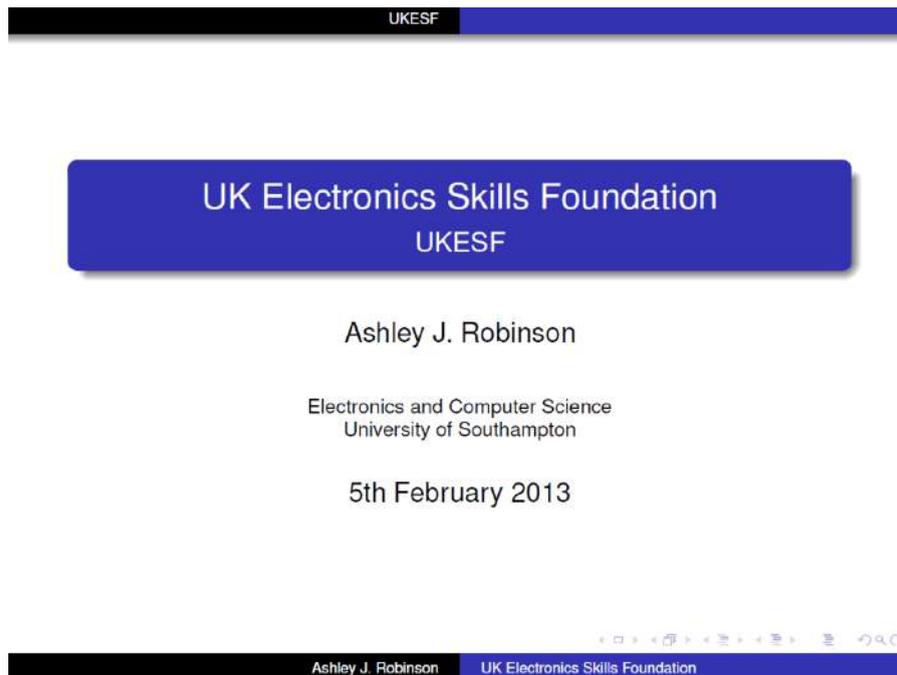


FIGURE 2: Slide 1

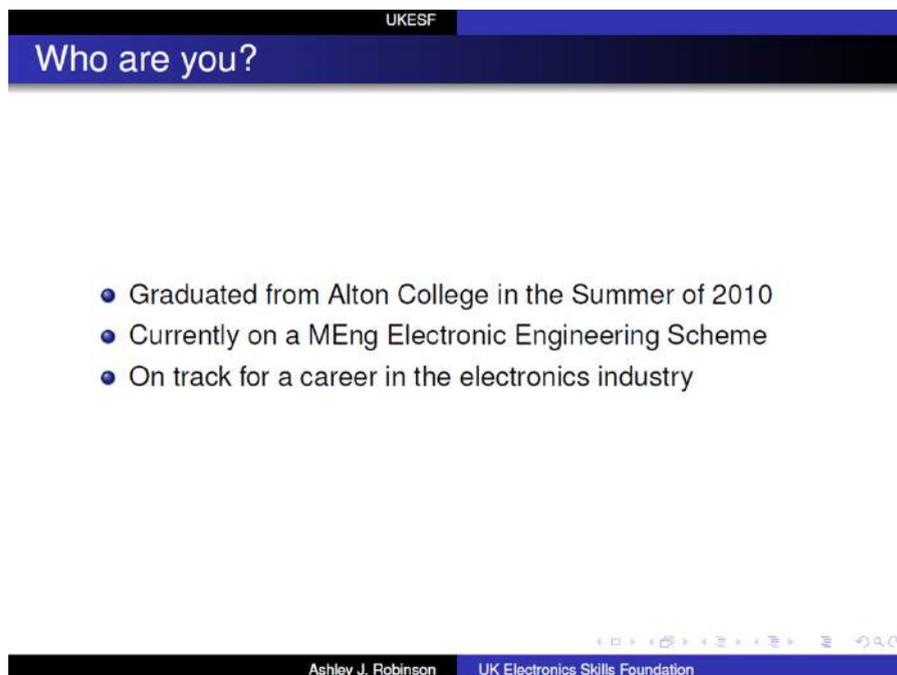


FIGURE 3: Slide 2

UKESF

Why are you here?

To get people into electronics...





Who's thinking of going to uni?
Who's thinking of reading engineering?



Ashley J. Robinson UK Electronics Skills Foundation

FIGURE 4: Slide 3

UKESF

Why get into electronics?

- It pays well (£40,000+ per annum)
- 20th best paid job in the UK (Guardian 2010/11)

19. Electronics engineer £45,086 (2009 n/a)

20th pct: £34,474. 70th pct: £51,477

Electronics engineers research and design, direct construction and manage the operation and maintenance of electronic motors, communications systems, microwave systems, and other electronic equipment. **Related job titles:** Designing engineer, microwave engineer, radar engineer (research), radio engineer (professional).

19. Electrical engineer £44,202 (+3.8%)

10th pct: £20,600. 90th pct: £24,891

Similar to electronics engineers, electrical engineers often apply their skills in more industrial settings: business electrical equipment, power plants and other electrical products and systems. **Related job titles:** Generating engineer, electricity supplier, power engineer, power transmission engineer.

19. Electrical engineer £44,867 (+1.2%)

10th pct: £36,668. 70th pct: £51,600

Also known as: Generating engineers (electricity supplier), power engineers, power transmission engineers. **What they do:** Similar to electronics engineers, they often apply their skills in more industrial settings: towards electrical equipment, power stations and other products and systems. **What I never:** Oliver Gilbert, widely considered the founder of electrical engineering, died of tubercle, plague in 1655.

20. Financial institution manager £44,161 (+6.5%)

10th pct: £24,994. 80th pct: £11,223

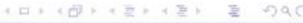
Also known as: Bank managers, banking society managers, post office managers, loan administrators. **What they do:** Plan, organise and direct the activities and resources of banks, building societies, insurance companies and post offices. **What I never:** A third of bank managers in a 2008 survey said they were working less.

Working life: the bank manager

21. Electronics engineer £40,772 (-2.5%)

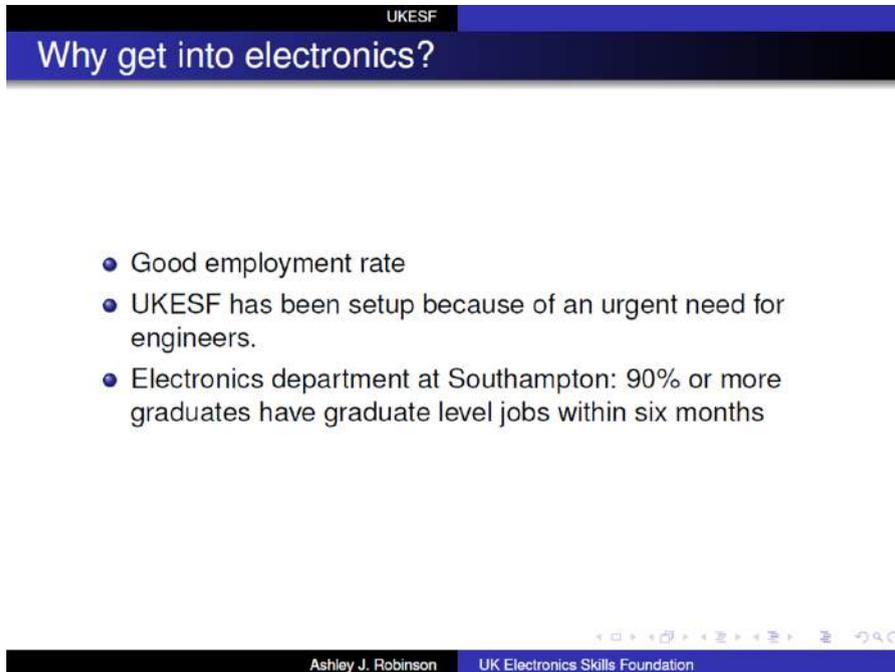
20th pct: £35,105. 70th pct: £51,253

Also known as: Broadcasting engineers, microwave engineers, radar engineers (research), radio engineers (professional). **What they do:** Research and design, direct construction and manage the operation and maintenance of electronic motors, communications systems, microwave systems, and other electronic equipment. **What I never:** Nikola Tesla, pioneer of alternating current electricity, claimed in 1902 to have invented a fuel-free power generator that ran off 'cosmic energy' - but his designs have never been discovered.



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FIGURE 5: Slide 4



UKESF

Why get into electronics?

- Good employment rate
- UKESF has been setup because of an urgent need for engineers.
- Electronics department at Southampton: 90% or more graduates have graduate level jobs within six months

Ashley J. Robinson UK Electronics Skills Foundation

This slide features a blue header with the UKESF logo and the title 'Why get into electronics?'. The main content consists of three bullet points. The footer includes the presenter's name and the organization's name.

FIGURE 6: Slide 5



UKESF

Why get into electronics?

An EE degree leads to many different careers...



<http://www.ecs.soton.ac.uk/careers>

Ashley J. Robinson UK Electronics Skills Foundation

This slide features a blue header with the UKESF logo and the title 'Why get into electronics?'. Below the title is the text 'An EE degree leads to many different careers...'. The central part of the slide displays a collection of logos for various companies, including Critical software, Snowflake software, Atmel, Goldman Sachs, Fidelity, J.P.Morgan, ARM, IBM, BAE SYSTEMS, amazon.com, BBC R&D, Ocado, and Bloomberg. At the bottom, there is a URL: 'http://www.ecs.soton.ac.uk/careers'. The footer includes the presenter's name and the organization's name.

FIGURE 7: Slide 6

UKESF

Why get into electronics?

It's fun!



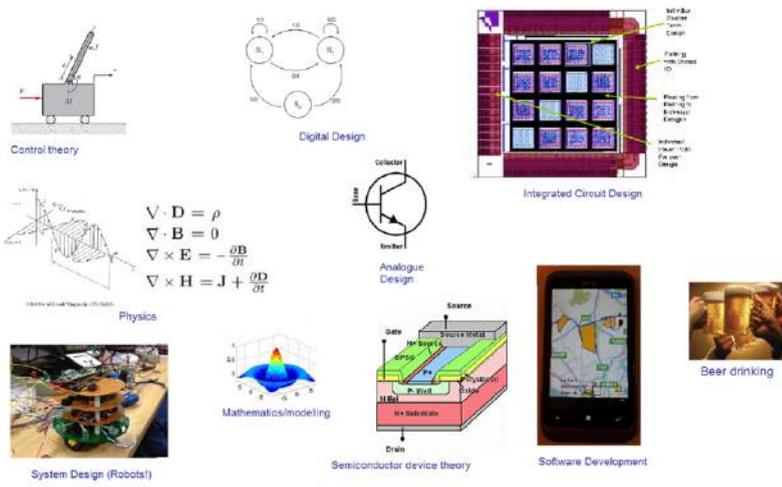
Ask a questions to win! <http://users.ecs.soton.ac.uk/srg/chaos/>

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FIGURE 8: Slide 7

UKESF

What happens at Uni



Control theory

Digital Design

Integrated Circuit Design

Physics

System Design (Robots)

Mathematics/modeling

Semiconductor device theory

Software Development

Bear drinking

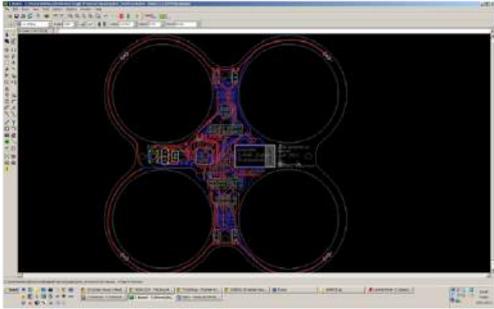
Ashley J. Robinson UK Electronics Skills Foundation

FIGURE 9: Slide 8

UKESF

What happens at Uni

My Dissertation (3rd year project)



Flying Circuit boards! What more do you need?
[YouTube: Towards a swarm of Nano Quadrotors](#)

Ashley J. Robinson UK Electronics Skills Foundation

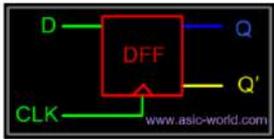
FIGURE 10: Slide 9

UKESF

What happens in the workplace

I spent the last summer working for Cambridge Silicon Radio (CSR) through UKESF.

- SystemVerilog (HDL)
- Application Specific Integrated Circuit (ASIC) design
- Near Field Communication (NFC)



```

1 // D flip-flop Code
2 module d_ff ( d, clk, q, q_bar);
3 input d ,clk;
4 output q, q_bar;
5 wire d ,clk;
6 reg q, q_bar;
7
8 always @ (posedge clk)
9 begin
10 q <= d;
11 q_bar <= !d;
12 end
13
14 endmodule

```

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FIGURE 11: Slide 10

UKESF

University is expensive! (£9,000 a year + living!!)

Bursary/Scholarships/Awards

- Access to Southampton = £1000 (Parents income)
- Zepler Scholarship = £1500 (Need good grades)
- UKESF = £1575

A summer working in a tech company

- £18,000 pro rata
- 10 weeks = £3500
- A lot of fun

and goverment funding

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This slide features a blue header with the UKESF logo and a main title in white text on a dark blue background. The content is presented in a white area with blue bullet points. A footer bar contains the presenter's name and the organization's name.

FIGURE 12: Slide 11

UKESF

Which Uni for Electronics

Russell group is great but in particular...

- Bristol
- Edinburgh
- Imperial College London
- Manchester
- Surrey (Just up the road in Guildford)
- York
- Cambridge (Take general engineering then specialise in EE)

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FIGURE 13: Slide 12

UKESF

Which Uni for Electronics

...and of course Southampton...

Engineering: electronic and electrical
More academic subjects and a link to the headings

Ranking	Name of institution	Graduation rate (%)	Satisfied with course (%)	Satisfied with teaching (%)	Satisfied with feedback (%)	Student staff ratio	World class research (%)	Average entry score	Value added score (VAF)	Career entry index
1	Southampton	100.0	85	84	85	9.4	80	488	5	95
2	Manchester	80.0	85	84	81	12.9	9	502	8	78
3	Exeter	80.0	81	80	87	11.8	0	479		
4	Sheffield	85.7	82	82	82	15.0	8	461	4	84

<http://www.guardian.co.uk>

CUU Rank 2012-2013	University Name	Student Satisfaction	Entry Standards	Research Assessment	Graduate Prospects	Overall Score
1	Cambridge	4.1	933	3.95	84.0	108.0
2	Southampton	4.0	488	2.85	84.0	51.2
3	Imperial College London	3.9	534	2.99	88.0	89.8

<http://www.thecompleteuniversityguide.co.uk>

High grades are good but not always a necessity.

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FIGURE 14: Slide 13

UKESF

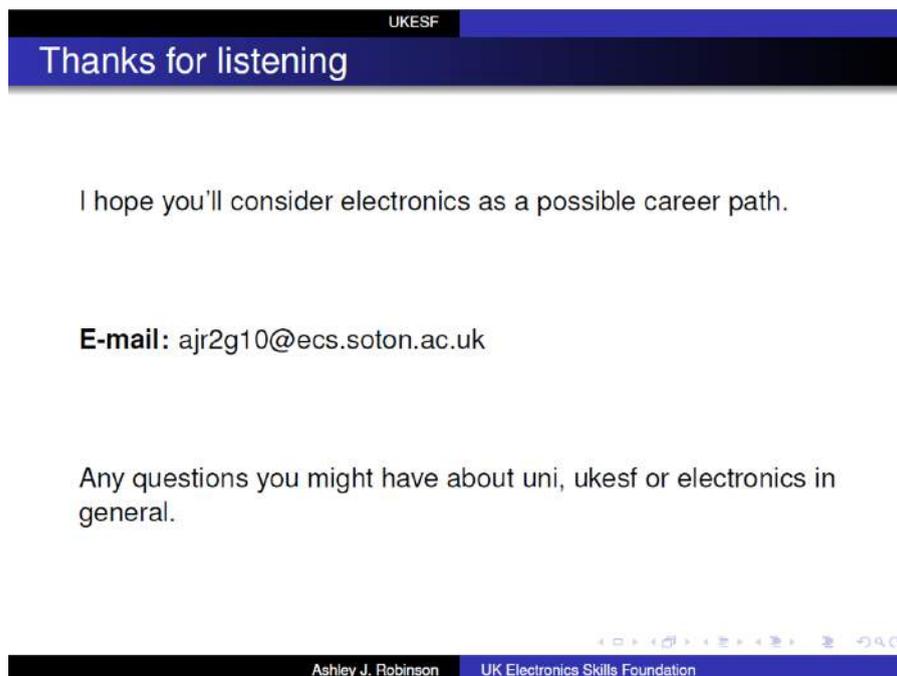
Tips for Electronic Engineerings

Learn to program! It's free!

- C
- Python

Ashley J. Robinson UK Electronics Skills Foundation

FIGURE 15: Slide 14

The slide features a blue header bar with the text 'UKESF' on the left and 'Thanks for listening' in white on the right. The main body of the slide contains three paragraphs of text. At the bottom, there is a footer bar with navigation icons on the left and the text 'Ashley J. Robinson' and 'UK Electronics Skills Foundation' on the right.

UKESF

Thanks for listening

I hope you'll consider electronics as a possible career path.

E-mail: ajr2g10@ecs.soton.ac.uk

Any questions you might have about uni, ukesf or electronics in general.

Ashley J. Robinson UK Electronics Skills Foundation

FIGURE 16: Slide 15

References

- Steve R. Gunn. The chaotic oscillator, December 2012. Southampton University.
<http://users.ecs.soton.ac.uk/srg/chaos/>.
- Christian Zeitnitz. Soundcard oscilloscope, 2012. <http://www.zeitnitz.de/Christian/scope.en>.