

Department for
Continuing Education



UNIVERSITY OF
OXFORD

Technology Programme 2014

Short Courses for Professionals in:

High-Speed Digital Engineering and EMC

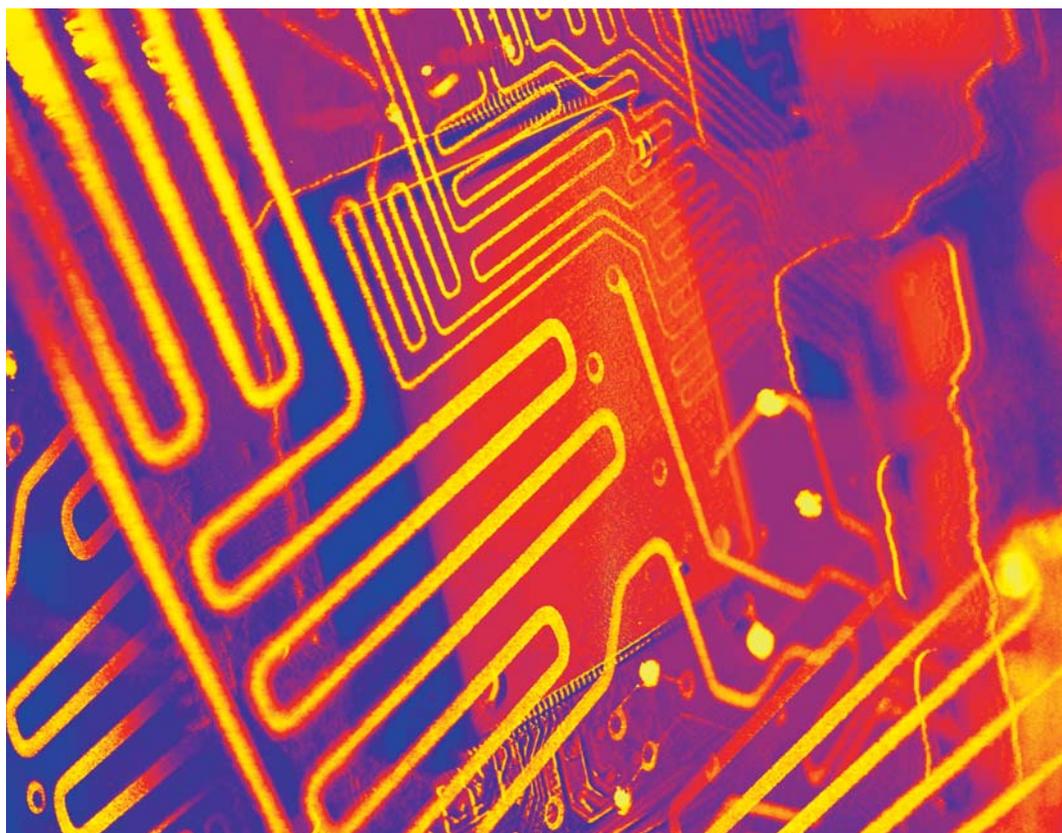
Systems Engineering

Electronics

Management Skills for Engineers and Scientists

Telecoms and Mobile Technologies

Nanotechnology



Technology Programme 2014



Our Programme

The University of Oxford offers one of the finest programmes of short courses for professionals in the global electronics and telecoms industries.

Our Presenters

Our course presenters are specialists in the areas they teach and are drawn from industry and academia around the world. Many of them are involved in cutting-edge research in the world of electronics and telecoms, and are internationally recognised.

Our Courses

Most courses are taught over one to five days at Rewley House, our main site, and at other venues around the historic city of Oxford; the ten-week Online Introduction to Electronics course can be taken from anywhere in the world. Thousands have attended our courses since the programme was established in 1989 and we continue to develop new courses as part of our ongoing commitment to education.

In-house Training

We are able to offer many of our courses as in-company courses and can tailor a course specifically to your needs. This can be a particularly cost effective method if training a number of staff. Please contact us for details.

Sincerely,

Dr Stephen Morris
Academic Director

Associate Professor, Department of
Engineering Science, University of Oxford

PAGE	Course	2014 Dates
High-Speed Digital Engineering and EMC		
1	High Frequency Measurements (probes and equipment used in Signal Integrity and EMC work)	10–11 Jun
2	EMC and ESD Lab Techniques for Designers (troubleshooting to proactively avoid field or compliance problems)	12–13 Jun
3	Printed Circuit Board Design for Real-World EMI Control	17–18 Jun
3	Advanced EMC: Fullwave Modelling for EMC and Signal Integrity	19–20 Jun
4	Electronic Product Design and Retrofit for EMC	19–20 Jun
4	Introduction to Signal and Power Integrity	23–24 Jun
5	Intermediate Signal and Power Integrity	25–26 Jun
5	Practical Power Distribution Design, Simulations and Measurements (decoupling and bypassing design / simulation and measurements of power distribution networks)	30 Jun–1 Jul
Electronics		
6	Online Introduction to Electronics (10 weeks online)	28 Apr–4 Jul
6	Overview of Electronics	3–4 Jun
7	Overview of Digital Electronics	5–6 Jun
7	Practical RF/Microwave Design	9–13 Jun
7	Practical Antenna Design: From Theory to Practice	11–12 Jun
8	Introduction to Data Converters	24–25 Jun
8	Advanced Data Converters	25–26 Jun
8	Successful RF PCB Design	10 Jul
9	Digital Signal Processing - Theory and Application	8–10 Jul
9	Digital Signal Processing Implementation - Algorithms to Optimisation	11 Jul
Telecoms and Mobile Technologies		
10	3G, 4G and Beyond - Bringing Networks, Devices and the Web Together	30 Apr–1 May
10	Big Data and Telecoms	1 May
11	ForumOxford: Mobile Apps and Technologies Conference	2 May
11	LTE and LTE Advanced Air Interface Explained	26 Jun
12	3GPP Service Provision, Control and Charging in the Evolved Packet Core	27 Jun
12	LTE and LTE-Advanced: System Design and Operation	30 Jun–4 Jul
13	LTE Theory and Network Planning	30 Jun
13	LTE Release 8–9 and 10–12	1–2 Jul
14	LTE and HSPA Terminal RF Design Challenges	3 Jul
14	UMTS / HSPA / LTE Protocols	4 Jul
15	Microwave Planning and Design Masterclass	2–4 Jul
15	White Space Networks for Machine to Machine (M2M) Services	2 Jul
Systems Engineering		
16	Systems Engineering Fast-Track (course held over two weekends)	3–4 and 17–18 May
Management Skills for Engineers and Scientists		
17	Managing Innovative Technology	30 Jun
17	Applying Knowledge Management: Principles and Practices	1 Jul
17	Successful Change Management	2 Jul
18	Essentials of Project Management	3 Jul
18	Advanced Project Management	4 Jul
Nanotechnology		
19	Online Course: Fundamental Characterisation for Nanotechnology	28 Apr–6 Jul
19	Nanotechnology Summer School - Introduction to Bionanotechnology	30 Jun–4 Jul
19	Nano-scale Materials Characterisation	5–6 Jul
20	Online Course: The Wider Context of Nanotechnology	13 Oct–30 Nov
20	Online Course: The Fundamental Science of Nanotechnology	12 Jan–22 Mar 2015
21	Online Course: Postgraduate Certificate in Nanotechnology	13 Oct 2014–5 Jul 2015

High-Speed Digital Engineering and EMC

Electronics

Telecoms and Mobile Technologies

Systems Engineering

Management Skills for Engineers and Scientists

Nanotechnology

High-Speed Digital Engineering and EMC

A series of high-speed digital engineering, signal integrity, EMC and ESD courses taught by leading industry specialists over two days.

For digital logic engineers, system architects, EMC/EMI specialists, signal integrity specialists, technicians, printed wiring layout professionals, applications engineers, PCB design engineers, system designers, test engineers and anyone who works with digital logic at high speeds (20MHz to 20GHz and beyond).

High Frequency Measurements

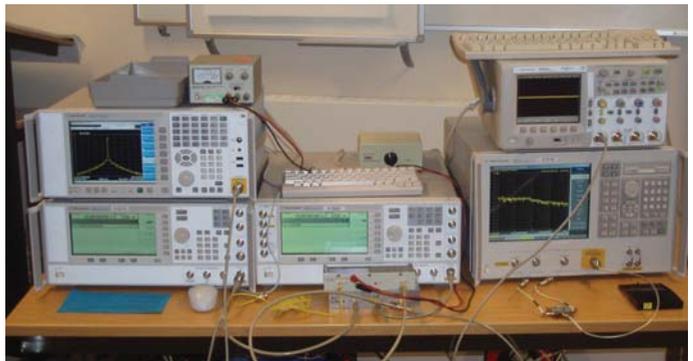
(probes and equipment used in Signal Integrity and EMC work)

10–11 June 2014

This practical and demo-based course describes in depth how to measure signal and noise in high-speed digital and analogue circuits. These measurements are then used to characterise high-speed effects in electronic circuits including design verification and troubleshooting. Sources of measurement error are discussed. The measurement techniques are related to design issues to improve signal integrity, equipment EMC performance, and the overall reliability of electronic systems.

Just added for this presentation is a new section on switching noise from circuits like switching power supplies, class D amplifiers, PWM controllers, and similar circuits. Characterisation of the switching noise and its effects are covered in a unique, easy-to-understand way.

Presenter: Douglas Smith, Author of *High Frequency Measurements and Noise in Electronic Circuits*



EMC and ESD Lab Techniques for Designers (troubleshooting to proactively avoid field or compliance problems)

12–13 June 2014

This practical and demo-based course covers techniques for finding design issues that may cause EMC and/or ESD compliance problems early in the design cycle, long before an official EMC/ESD test. This can be accomplished in the development lab without the need for expensive, specialised equipment. These techniques are easy to use and can find a wide range of potential EMC and ESD problems in a design on the lab workbench. This course describes each technique in depth, how to apply it, and how to interpret results. Just added is a new section on design troubleshooting by considering an electronic system as a collection of resonant circuits. This powerful way of looking at electronic systems can expose design problems at an early stage in the design cycle.

After covering EMC and ESD topics, the course will focus on advanced troubleshooting techniques to address not only EMC and ESD issues, but also troubleshooting general design problems both in the laboratory and in field installations. Doug Smith has developed these techniques over more than 30 years of working in this area. The techniques presented are very effective at reproducing problems that occur in the field infrequently. This part of the course describes each technique in depth, how to apply it, and how to interpret results. A list of recommended equipment for troubleshooting difficult problems is presented. Emphasis is placed on delivering practical knowledge that can be used immediately on the job. Some classroom time is reserved to discuss problems and interests of those attending.

Presenter: Douglas Smith, Author of *High Frequency Measurements and Noise in Electronic Circuits*

Printed Circuit Board Design for Real-World EMI Control

17–18 June 2014



This course focuses on the basic causes of EMC problems, and how to overcome these problems. It is not just a list of “rules of thumb” but rather it helps the student understand why EMC problems happen, and what can be done to eliminate them. These skills can be applied to real-world product design immediately. Formulas and equations are not required and are minimised throughout the course.

Presenter: Dr Bruce Archambeault, Archambeault EMI Enterprises, USA



Now also available as an online/distance learning course with live online follow-up sessions.

This course is now available to companies in recorded video format for groups of engineers.

You will receive a number of videos of the course, broken down into the individual subject areas. Each recorded video will be followed by a live online video conference Q&A session with the Course Presenter, Dr Bruce Archambeault.

In addition to the videos, full course materials will be supplied.

Note that this format is only available to companies and is not for sale to individuals.

Please email emc@conted.ox.ac.uk for more information.

Advanced EMC: Fullwave Modelling for EMC and Signal Integrity

19–20 June 2014

This course examines the various full-wave simulation techniques, their strengths and their weaknesses, and when they should be used for various SI and EMC problems. It includes examples of applying full-wave techniques to real-world problems, such as decoupling power/ground planes, emissions from PC boards, connector effects (cross-talk, resonance, etc), effects of vias on high speed signals, and more.

This is an advanced course following on from Dr Bruce Archambeault's Printed Circuit Board Design for Real-World EMI Control course.

Presenter: Dr Bruce Archambeault, Archambeault EMI Enterprises, USA

Electronic Product Design and Retrofit for EMC

19–20 June 2014

Are you frustrated with high frequency noise problems? Tired of failing radiated emissions requirements at EMI test labs? Looking for a logical, systematic way of analysing and solving electrical noise problems that is based on the latest academic research?

This course presents a unique blend of applications, hardware demonstrations, and supporting theory to help design engineers and EMC engineers master key electrical noise reduction techniques. The underlying theory and techniques are equally applicable during design or troubleshooting of regulatory compliance, electrostatic discharge (ESD), RF/wireless, and self-interference problems.

After attending this course, you will be able to:

- Systematically analyse and solve noise problems by using the noise model to create and analyse a noise circuit schematic
- Minimise radiated EMI by designing low inductance signal interconnects
- Understand ground loops, how to represent them in an equivalent circuit, and how to eliminate them
- Clearly identify and manage the three different types of “ground” in schematics and physical circuits
- Identify “accidental antennas” in new designs
- Understand and measure common-mode current in emissions and immunity problems
- Improve the quality of sensor and instrumentation signals in the presence of noise

Presenter: Lee Hill, Member of Adjunct Faculty, Worcester Polytechnic Institute (WPI), MSEE University of Missouri-Rolla, Founding Partner, Silent Solutions LLC, USA

Introduction to Signal and Power Integrity

23–24 June 2014

This course will provide participants with the fundamentals of signal propagation and power distribution network design. Starting from physics and network principles, the course moves on to more advanced SI, PI, and measurement concepts critical to current high-speed systems. These include transmission lines and signal propagation in the time and frequency domains, for example, basic principles, characteristics of complex discontinuities, as well as simple smooth conductor and dielectric losses that impact high-speed propagation. The course also looks at power distribution network analysis basics including charge delivery, PDN impedance, noise voltage, and design directions such as decoupling, layer stackup and materials.

Presenter: Dr Bruce Archambeault, Archambeault EMI Enterprises, USA

Intermediate Signal and Power Integrity

25–26 June 2014

This course will provide participants with the knowledge to break down the link path for analysis and design. It also covers fundamental jitter concepts, as well as developing parasitic models for non-ideal geometries in the link path. We explore a systematic approach to PDN design including target impedance and its limitations, reconciling TD/FD concepts for PDN design, the effect of stackup and decoupling capacitors, and modeling the PDN for multi-layer boards.

Presenter: Dr Bruce Archambeault, Archambeault EMI Enterprises, USA

Practical Power Distribution Design, Simulations and Measurements

(decoupling and bypassing design / simulation and measurements of power distribution networks)

30 June–1 July 2014

This course provides an overview of power distribution design practices proven by many years of successful designs. Good and bad design choices are illustrated and put into context of electrical performance, layout constraints, cost and size. The primary focus is to explain and illustrate the underlying physics with minimal mathematics so that designers can apply the trade-offs and design solutions in their everyday work. Design rules are illustrated by live HW and SW demonstrations.

Presenter: Dr Istvan Novak, Senior Principal Engineer, Oracle



A series of technical electronics courses taught by leading industry and academic specialists over one to five days.

For electronics design engineers, antenna engineers, RF designers, PCB designers, applications engineers, test engineers, wireless and radar system architects, signal processing designers and technical managers.

Online Introduction to Electronics

10 weeks online

28 April–4 July 2014



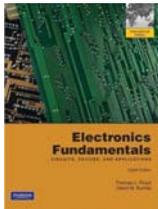
This online course introduces you to the basic ideas behind electronic circuits. The course consists of ten units, each of which will require around 5–10 hours of study depending on your level of knowledge. After taking the course you should have a good idea of how electronic systems work and how they are made.

The course is particularly suitable for individuals who have little prior knowledge of electronics but need to better understand the electronics they come into contact with at work. A previous exposure to basic science and maths at school will be assumed.

Presenter: Dr Will Moore, Emeritus Fellow, Jesus College, University of Oxford

Overview of Electronics

3–4 June 2014



This hands-on course is intended for individuals with little prior knowledge of electrical/electronic engineering who want to get a feeling for the subject and for individuals whose knowledge is “rusty” or out-of-date. It gives a quick insight into modern electronics with an emphasis on practical devices and systems.

The course is particularly suitable for individuals who have little prior knowledge of electronics but need to better understand the electronics they come into contact with at work. A previous exposure to basic science and maths at school will be assumed.

Presenter: Dr Will Moore, Emeritus Fellow, Jesus College, University of Oxford

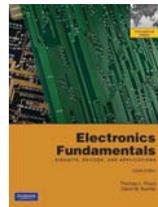
Overview of Digital Electronics

5–6 June 2014

This hands-on course is intended for individuals with little prior knowledge of electrical/electronic engineering who want to get a feeling for the subject and for individuals whose knowledge is “rusty” or out-of-date. It gives a quick insight into modern digital electronics with an emphasis on practical devices and systems.

The course is particularly suitable for individuals who have little prior knowledge of electronics but need to better understand the electronics they come into contact with at work. A previous exposure to basic science and maths at school will be assumed.

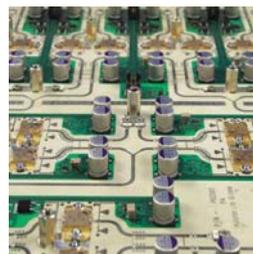
Presenter: Dr Will Moore, Emeritus Fellow, Jesus College, University of Oxford



Practical RF/Microwave Design

9–13 June 2014

This intensive, five-day practical course provides acceleration through the RF design learning curve by presenting a comprehensive introduction to RF and microwave design theory, techniques and measurements. It gives an overview of the fundamental concepts involved with RF/Microwave design and presents design methodologies for both passive and active RF and microwave circuits, common test and measurement issues and the subject of antenna design. “Hands-on” sessions of this course use the AWR Microwave Office design suite.



Presenters: Dr Peter Gardner, Reader in Microwave Engineering, School of Electronic, Electrical and Computer Engineering, University of Birmingham

Andy Dearn, Senior Consultant Engineer, Plextek RF Integration, Plextek Limited

Graham Payne, Microwave Applications Consultant, Graham Payne Consulting

Prof Yi Huang, Head of High Frequency Engineering Group, University of Liverpool

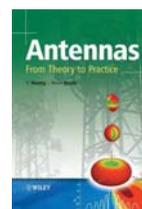
Practical Antenna Design: From Theory to Practice

11–12 June 2014

Created specifically for engineers and designers who work with radar, radio communications and RF/microwave engineering, this workshop will give participants an excellent understanding of antenna theory and techniques, and develop the practical skills to analyse, design and measure various antennas. An introduction to the very latest developments in antenna theory and technology will be presented. The participants will have the opportunity to use industry standard software to design a mobile antenna, and use equipment to conduct antenna measurements during the course. A popular antenna textbook written by the presenters is also available.

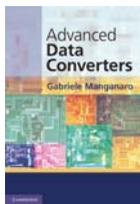
Presenters: Prof Yi Huang, Head of High Frequency Engineering Group, University of Liverpool

Dr Kevin Boyle, Antenna Systems Architect, EPCOS



Introduction to Data Converters

24–25 June 2014



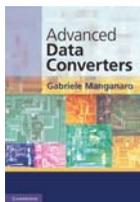
Data Converters (A/Ds and D/As) are, at the same time, among the most pervasive, complex and diverse analogue systems. After giving some application context, this course will provide an introduction to the basic concepts, architectures, trade-offs and trends in modern analogue-to-digital (A/D) and digital-to-analogue (D/A) converters. The course will cover basic concepts of quantisation, sampling, the metrics to characterise data converters' performance and the main data converter architectures. Circuit examples will illustrate the technical challenges, trade-offs and design techniques.

All delegates will receive a copy of the latest edition of *Advanced Data Converters* by G Manganaro (Cambridge University Press).

Presenter: Dr Gabriele Manganaro, Engineering Director for High Speed Data Conversion, Analog Devices, Inc., USA

Advanced Data Converters

25–26 June 2014



Increasing performance demands, together with advances in nanometer scale CMOS processes and higher system level integration, have contributed to a rapid increase in the complexity of modern A/Ds and D/As. The course assumes familiarity with fundamentals of analogue IC design and data converters and will cover the latest architectures and design techniques in this rapidly evolving field. Circuit examples will illustrate the technical challenges, trade-offs and design techniques.

All delegates will receive a copy of the latest edition of *Advanced Data Converters* by G Manganaro (Cambridge University Press)

Presenter: Dr Gabriele Manganaro, Engineering Director for High Speed Data Conversion, Analog Devices, Inc., USA

Successful RF PCB Design

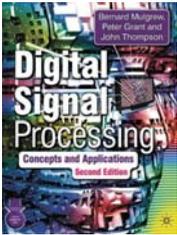
10 July 2014

This intensive one-day course provides a thorough introduction to the principles of RF PCB design techniques in an intuitive and practical way including analogue RF systems, digital RF systems, how signals cross couple between circuits, minimising impact of digital noise, performance and limitations of physical components, PCB Technology, PCB layout, implementation and examples of potential layout problems.

Presenters: Tony Richards, Senior Consultant Engineer, Plextek RF Integration, Plextek Limited
Steve Williamson, VP Operations, CRFS Ltd

Digital Signal Processing – Theory and Application

8–10 July 2014



This course gives a comprehensive grounding in DSP concepts and algorithms plus practical information on the design and implementation of DSP systems. It provides a good understanding of DSP principles and their implementation, and equips the participant to put the ideas into practice and/or to tackle more advanced aspects of DSP. The theoretical knowledge is illustrated by application examples, demonstrations and work in the laboratory.



The hands-on laboratory sessions include simulation of signals and systems in both the time and frequency domains and by working through illustrations of basic DSP functions. There are also practical experiments with audio inputs and outputs, and experiments with external equipment to explore the real-time capability of DSP. All delegates will receive a free copy of *Digital Signal Processing: Concepts and Applications* (Mulgrew, Grant, Thompson – Palgrave Macmillan).

Presenters: Dr Will Moore, Emeritus Fellow, Jesus College, University of Oxford
John Edwards, Senior Field Applications Engineer, Xmos Semiconductors Ltd

Digital Signal Processing Implementation – Algorithms to Optimisation

11 July 2014

A one-day supplement to the Digital Signal Processing course that takes the theory and translates it into practice. It shows how to take common DSP algorithms and map them onto common processor architectures, and gives a guideline for how to choose a DSP device. In addition to the algorithmic coding issues, the course looks at hardware-specific functionality such as internal or external memory and how to use DMA engines to optimise the use of both.

Presenter: John Edwards, Senior Field Applications Engineer, Xmos Semiconductors Ltd

Telecoms and Mobile Technologies

High-Speed Digital Engineering and EMC

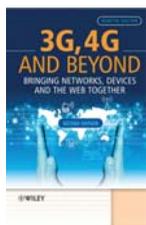
Electronics

A series of telecoms and mobile technologies courses taught by leading industry specialists over one to five days.

For RF and baseband engineers, radio planners, service developers, equipment designers and telecoms consultants, mobile application developers, software architects, telecoms consultants, digital media executives, equipment vendor, media and content provider, and network providers.

3G, 4G and Beyond - Bringing Networks, Devices and the Web Together

30 April–1 May 2014



This two-day course gives a sound technical introduction to LTE and explains the decisions taken during standardisation. In addition, the course examines how UMTS networks were enhanced to also offer high-speed Internet access. On the mobile device side the course looks at new device hardware developments, voice and multimedia services and the mobile web 2.0. We consider how the systems, devices and software work and the reasons behind why they are designed in this particular way. How these elements strongly influence each other is discussed as well as how network capabilities, available bandwidth, impact of femtocells, mobile device capabilities and new application concepts will shape the way we communicate in the future.

The course is an ideal end-to-end introduction to wireless, from smartphone software architecture on the one end to core networks on the other, making it a valuable resource for anyone working in the industry.

Presenters: John Edwards, Senior Field Applications Engineer, Xmos Semiconductors Ltd
Martin Sauter, Author at wirelessmoves.com
Ajit Jaakar, Mobile Telecoms Specialist and Author, Futuretext

Big Data and Telecoms

1 May 2014

The Big Data and Telecoms course addresses the new opportunities within telecoms and big data created due to changing regulation, high data volumes and new technologies. The course is a valuable resource to telecoms industry professionals who want to understand how big data concepts will apply to telecoms/mobile.

The course covers an introduction to big data followed by an understanding of telecoms data sets and how they integrate with external data sets. It covers themes such as integration into the telecom infrastructure - telecoms APIs, Internet of Things data, real-time data and vendor strategies.

We focus overall on operator case studies and the meaning of 'Data Scientist' for the telecoms operator.

Presenter: Ajit Jaakar, Mobile Telecoms Specialist and Author, Futuretext

ForumOxford: Mobile Apps and Technologies Conference 2 May 2014

ForumOxford Mobile Apps and Technologies group, the web discussion forum of the Technology Programme, was established to bring together the best thinkers in the telecoms industry to enable the sharing of ideas on all aspects of mobile applications with like-minded members of the community. ForumOxford continues to influence the mobile industry and is a place where many of the subjects that will affect the future of mobile telecoms are first debated.

The lively online discussions within ForumOxford's online environment resulted in numerous requests for a face-to-face event to capitalise on the online forum's success. Participation in ForumOxford online and the ForumOxford: Mobile Apps and Technologies Conference provides access to recognised leaders in mobile technology and apps and related technology fields. As all those attending in previous years have discovered, ForumOxford is a great place to meet others who are pioneers in the world of mobile. In a poll by the leading New York publication Fierce Wireless, six of the top 20 mobile blogs worldwide belong to ForumOxford members.

Who should attend?

Mobile technology and Web experts and visionaries, telecoms leaders and anyone who has an interest in the future of mobile, apps, innovations and technologies.

The conference will be chaired by: Ajit Jaokar, Mobile Telecoms Specialist and Author, Futuretext
Tomi T. Ahonen MBA, Author of 10 books on mobile

LTE and LTE Advanced Air Interface Explained 26 June 2014

The astronomical rise of LTE has resulted in our needing a whole new vocabulary and an understanding of baffling acronyms and concepts. This course cuts through the complexity to explain the core essential principles in a clear and concise form for technical managers. We kick off with radio aspects of LTE and LTE Advanced, explaining how the waveform is generated at the base station and handset, using white board and simple take-away software. We explain the reasons why LTE outperforms WCDMA and we define the core parameters used in LTE radio planning and optimisation. LTE relies on a new IP-based Core Network, with alternative approaches to handover between base stations and handling of voice calls, and this is also covered in the course. With the experts available all day, there is plenty of scope to extend areas that are most useful to you.

Presenters: Dr Jonathan Moss, Telecoms Trainer and Consultant

Laurent Noël, Mobile Devices, System Performance Analyst – Videotron (formerly Senior System Architect at ST-Ericsson)

Neil Wiffen, Senior Technical Instructor, Red Banana Wireless Ltd

3GPP Service Provision, Control and Charging in the Evolved Packet Core

27 June 2014

This course details the emerging techniques defined by 3GPP for the provision, management and charging of services using a policy controlled Evolved Packet Core network. Features have been introduced to more easily manage network capacity, differentiate subscribers and dynamically manage services, all of which can assist in protecting and optimising valuable network resources. New Policy Control and Charging mechanisms facilitate more centralised management of QoS control, service definitions and subscriber access profiles, and a comprehensive understanding of these mechanisms is essential to successfully deploy and manage profitable services in evolving wireless networks.

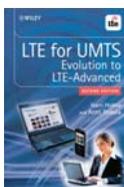
This course is for those involved in:

- Strategic planning
- Network engineering and optimisation
- Roaming policy
- Technical team leading
- Application development
- Technical sales
- Product marketing
- Product and service development
- Service provisioning and deployment
- Charging and Billing
- Wireless consulting
- Third-party service provision
- RAN engineering
- Value added service provision
- Capacity dimensioning
- Network signalling
- Service management
- Private network deployment

Presenter: Neil Wiffen, Senior Technical Instructor, Red Banana Wireless Ltd

LTE and LTE-Advanced: System Design and Operation

30 June–4 July 2014



This five-day course provides a detailed end-to-end description and explanation of the global LTE and LTE-Advanced radio standards, with presentations from Harri Holma and Antti Toskala, authors of the definitive books, *LTE for UMTS - OFDMA and SC-FDMA Based Radio Access*, *LTE for UMTS: Evolution to LTE-Advanced* and *LTE-Advanced: 3GPP Solution for IMT-Advanced*. The course looks at how 4G LTE radio access and core networks fit together to give operators an easier-to-manage and lower cost end-to-end solution. With full explanations of OFDMA and SC-FDMA air interfaces, the course explains the evolutions of current standards. We explain the complexities of RF design of multi-mode, multi-band handsets and describe the signalling procedures used between handset and network. Real-world implementation aspects of the new technology are discussed, including system dimensioning and design, and the performance of mobile data applications. Emphasis throughout is placed on optimising the data capability of networks, including efficient packet data capacity, broadband wireless services, and radio resource management as well as upgrade paths for operators.

All delegates will receive a copy of *LTE for UMTS: Evolution to LTE-Advanced* by Harri Holma and Antti Toskala.

Presenters: Dr Harri Holma, NSN Fellow - Radio System Performance, Nokia Siemens Networks, Finland
Dr Antti Toskala, Head of 3GPP Radio Standardization, Nokia Siemens Networks, Finland
Dr Jonathan Moss, Telecoms Trainer and Consultant

Laurent Noël, Mobile Devices, System Performance Analyst - Videotron (formerly Senior System Architect at ST-Ericsson)

Neil Wiffen, Senior Technical Instructor, Red Banana Wireless Ltd

LTE Theory and Network Planning

30 June 2014

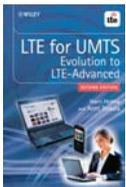
This course is Day 1 of the LTE and LTE-Advanced: System Design and Operation course, and can be taken on its own or as a primer to the full five-day course. It explains the benefits of the new LTE air interface and the many improvements over 3G WCDMA, including a high-level explanation of the System Architecture Evolution (SAE) and mobility management.

Using PC simulation tools we will provide a full explanation of the OFDMA and SC-FDMA modulation procedures, with some easy-to-understand FFT demonstrations along the way. We will look at multipath equalisation, use of cyclic prefix and random access procedures, with comparison back to 3G. With LTE today operating over a wide variety of different frequency bands across the world, we explain the numbering of the worldwide frequency allocations. Starting from the basics of communications theory, we derive the LTE air interface link budget for uplink and downlink directions, and look at some typical radio planning examples.

Presenter: Dr Jonathan Moss, Telecoms Trainer and Consultant

LTE Release 8–9 and 10–12

1–2 July 2014



This course comprises Days 2 and 3 of the LTE, LTE-Advanced and HSPA Evolution: System Design and Operation course, and can be taken on its own or as part of the five-day course. The course starts by describing the LTE network architecture and the 3GPP standardisation process. We then move on to radio layer operation and performance, the different radio band options and radio resource management. The course also focuses on the enhancements included in Releases 10, 11 and 12 with LTE-Advanced and the outlook for further evolution in Release 13. We describe the data speeds possible and the solutions for carrying voice over LTE. Finally we compare LTE performance with that of HSPA+.

Presenters: Dr Harri Holma, NSN Fellow - Radio System Performance, Nokia Solutions and Networks, Finland
Dr Antti Toskala, Head of 3GPP Radio Standardization, Nokia Solutions and Networks, Finland

LTE and HSPA Terminal RF Design Challenges

3 July 2014

This one-day course is Day 4 of the LTE and HSPA Evolution: System Design and Operation course and can be taken on its own or as part of the five-day course. With the explosion of frequency bands and band combinations, balancing the radio performance, hardware cost and total power consumption in the multi-mode multi-standard smartphone poses serious design challenges. This session presents an overview of solutions and strategies put in place by chipset platform vendors to deliver cost efficient HSPA+, LTE and LTE-advanced terminals, with a focus on the radio-frequency (RF) subsystem and RF- Front-End (RF-FE) architectures. We introduce the cellular RF subsystem architectures in detail, from RF- baseband and RF-FE control interfaces (example of MIPI® Alliance RFFE and DigRFSM v4), to SAW-less transceivers, to Power Amplifier Modules (PAM) and RF Front-End filtering trends. Additional challenges associated with Over-The-Air (OTA) smartphone performance and co-existence scenarios within the numerous subsystems of the multi-band / multi-mode “world-wide” phone are covered. The session also briefly introduces the specific challenges associated with implementation of LTE-Advanced carrier aggregation platforms. Finally we describe some of the novel architectures implemented to reduce the smartphone power consumption while meeting the demand for an always-on connectivity using high-resolution displays and powerful Application Engines (APE). An overview of challenges associated with the optimisation of APE and PA power consumption is presented using the example of ARM big.LITTLE™ processing technology and a comparison of average power tracking vs. envelope tracking.

Presenter: Laurent Noël, Mobile Devices, System Performance Analyst - Videotron (formerly Senior System Architect at ST-Ericsson)

UMTS / HSPA / LTE Protocols

4 July 2014

This course is Day 5 of the LTE and HSPA Evolution: System Design and Operation course and can be taken on its own or as part of the five-day course. This course presents a technical description of UMTS, HSPA and LTE Protocols from Release 99 through to Release 10 of the 3GPP specifications including the protocol structures and mechanisms that support communications across the Air Interface, (Uu and LTE-Uu) UTRAN, E-UTRAN, Core Network and EPC systems. S1, X2 and EPS signalling concepts and principles including peer location options and example signalling procedures are presented and RAB / E-RAB setup mechanisms discussed. The course also includes an overview of procedures relating to registration, security, mobility management, voice call setup and PS data session establishment. Femtocell protocol connectivity options are also presented.

Presenter: Neil Wiffen, Senior Technical Instructor, Red Banana Wireless Ltd

Microwave Planning and Design Masterclass

2–4 July 2014

This course combines theory with practical, real-world examples to provide an updated and comprehensive overview of how to plan microwave radio systems, to maintain current and next generation equipment. The transition from traditional TDM to packet-based Ethernet networks introduces many challenges, including synchronisation issues, and it is important to know how to exploit the significant economic benefits that the technological advances offer, while ensuring true carrier grade performance is achieved for critical applications. Radical cost savings can be achieved, as well as significant performance improvements, to achieve true fibre-like quality, if we have a holistic understanding of the many factors that contribute to cost and quality. Digital transmission can hide a myriad of underlying problems that only come to the fore under fading conditions. Coupled with that, the radio standards and software planning tools often have aspects relevant to the old analogue world embedded in them, which can distort the results if we do not understand the underlying principles. Many widely held industry myths and misconceptions have made it even harder to get an accurate view on how to really design cost effective and robust networks.

The course covers an update to the latest technology advancements on microwave equipment and standards as well as practical real-world examples of link design, fading issues, antenna systems, frequency planning and packet-based equipment, with advice based on field experience. This course would benefit anyone wanting a thorough introduction to this field, as well as experienced microwave design and maintenance engineers who want to get updated on the latest equipment and system design trends.

Presenter: Trevor Manning, Technical Trainer and Author

White Space Networks for Machine to Machine (M2M) Services

2 July 2014

M2M connections are anticipated to reach more than 50 billion connected devices by 2020. White space networks could have a key role in supporting these huge numbers of connections to fulfil the vision of a truly ubiquitous wide area network i.e. the emergence of 'the Internet of Everything'.

- What is white space?
- Understanding the concepts and characteristics of white space networks
- Regulatory approach and spectrum allocation
- Challenges and complexity of white space networks (greyspace, good neighbour issues etc.)
- Implied technologies
- Economics of white space devices
- Possible applications in the M2M space: continuous monitoring of vehicles, firmware upgrades for vehicles, networking for the smart grid, asset tracking of goods on the move, remote health monitoring and diagnosis, home and industrial building automation, security and control, defence and security, environmental monitoring and control etc.
- Current status and current white space standards

Presenters: Prof William Webb, CEO, Weightless SIG

Ajit Jaokar, Mobile Telecoms Specialist and Author, Futuretext

Systems Engineering

High-Speed Digital Engineering and EMC

Electronics

Telecoms and Mobile Technologies

Systems Engineering Fast-Track

3–4 and 17–18 May 2014 – course held over two weekends

This course is based on 20 years of experience in Systems Engineering and provides not only insights to the overall systems-engineering process, but detailed methods and tools that support that process. The methods and tools presented are pragmatic and practical and have been used on real programmes and bids in the range of £10m to £2bn.

This course is for you if:

- You have recognised that your organisation needs to improve in areas including: requirements management, system modelling and the systems-engineering process
- Your organisation has a target to reach higher CMMI® levels
- You are new to large-scale systems development or you want to refresh your existing knowledge and skills
- You are a team leader and want information that you can use to improve the performance of your team in an efficient manner

This course is for graduate-level engineers from companies that develop, or are part of a team that develops, complex systems, which have one or more of the following characteristics:

- Range in value from £10m to £2bn
- Have 500 to 2000 individually identified requirements
- Have safety or security critical elements
- Incorporate or interface with significant levels of legacy technology
- Involve teams of companies
- Involve more than one technology area, for example: software, electronics, electro-mechanics, hydraulics and human systems elements

Course content

The Systems-Engineering Process:

- Modelling your own systems-engineering process
- Elements of a high-quality systems-engineering process
- Moving your process to where it needs to be

A Systems-Engineering Database:

- Requirements: Writing requirements, management, methods, structures and traceability
- Configuration management and version control
- Metrics for process and product

Pulling it all together:

- Decision Analysis
- Capturing rationale for designs and process
- The Human Face of Systems-Engineering
- Integrating with other key disciplines

Systems Modelling:

- SysML and UML 2.0 for systems engineering
- Architectural frameworks – MODAF and DoDAF
- Modelling architectural design and interface control

Systems Integrity:

- Threads analysis
- Failure-domain analysis
- Quality Function Deployment
- Reviews and inspections

More than 150 engineers from both smaller and larger companies have attended this course since it was first run in 2006.

Presenters: Dr Rob Collins, Systems Engineering Specialist

Mark Collins, Chief Technical Officer, Operativ Ltd

Management Skills for Engineers and Scientists

Systems Engineering

Nanotechnology

Short, intensive and highly practical courses delivered at the University of Oxford or in-company. These courses are designed to give individuals and organisations the competitive advantage.

For professionals in management, research and technical roles, these courses are particularly suited to people working in science, medicine, engineering, electronics, information technology and other hi-tech fields.

Managing Innovative Technology

30 June 2014

Technology-based organisations need to innovate on ever-shorter timescales; governments need to create economic impact from research. How can organisations most effectively find, evaluate and process these innovative technologies to realise their commercial value? This course is aimed at those in translation or innovation roles in technology and research orientated organisations. It will introduce delegates to the systems and context behind open innovation, licensing, accessing markets and patent/IP strategy, based on Isis Innovation's experience of helping clients commercialise technology and IP in over fifty countries around the world.

Presenter: Dr Costas Chryssou, Managing Consultant, Isis Enterprise, University of Oxford

Applying Knowledge Management: Principles and Practices

1 July 2014

This intensive course is for those who would like to develop a comprehensive insight into the main aspects of knowledge management and equip themselves with the practical skills to build or begin the introduction of knowledge management interventions within their organisation. It will focus on the operations of organisations as a whole to provide comprehensive integrated solutions and ideas to the challenges faced by course participants.

Presenter: Dr John Wilson, Independent Consultant and Researcher



Successful Change Management

2 July 2014

This practical course investigates the main theories and principles of change management and relates these to current changes in the commercial and public sectors. It shows how successful change can be achieved at individual, team and organisation levels using practical tools and skills. A wide range of tools is discussed and practiced in relation to individual, group and organisational change. This course is for those who are responsible for, or involved in, managing change from small-scale interventions to large-scale restructuring. It considers how current economic circumstances can be used to drive forward necessary changes that might not be considered during more buoyant times.

Presenter: Dr John Wilson, Independent Consultant and Researcher

Essentials of Project Management

3 July 2014

This intensive one-day course provides a comprehensive introduction to the essential aspects of project management for scientists and engineers. The course will draw on relevant case studies, demonstrate useful software packages and prepare participants to apply learning from the course in their organisations.

The course covers the following key areas:

1. What is a project? And what is Project Management?
2. The Project Context and Process
3. Planning the Project
4. Budgeting the Project
5. Scheduling the Project
6. Allocating Resources to the Project
7. Delivering the Project

The course is designed specifically to benefit scientists and engineers in large or small public and private sector organisations with responsibility for project delivery, and assumes no prior training in project management techniques.

Presenters: Dr Chantal Cantarelli, Research Fellow, BT Centre for Major Programme Management, Saïd Business School, University of Oxford

Alexander Budzier, Researcher, BT Centre for Major Programme Management, Saïd Business School, University of Oxford

Advanced Project Management

4 July 2014

This course offers a condensed, yet comprehensive, overview of current and emerging best-practice methodologies and techniques for meeting the challenges of managing multiple, complex science and technology projects.

This intensive one-day course will explore the nature of managing projects. The day focuses on the “three Cs”: challenges, causes and cures. The course starts with looking at characteristics and challenges in project management. Major projects are inherently risky due to long planning horizons, complex interfaces and multi-actor processes, and non-standard technologies and designs.

One of the main challenges in project management is inadequate benefit, cost, and time forecasts. Consequently, benefit shortfalls, cost overruns, and delays are common during project implementation and often projects are challenged from the beginning. The course then looks at causes of risk and three types of explanations of causes are addressed: technical explanations, psychological explanations, and political-economic explanations.

Finally, the course discusses cures, and in particular how to de-bias projects through reference class forecasting; and how to avoid projects running out of control, so called Black Swans, through reducing social and technical complexities of projects.

Presenters: Dr Chantal Cantarelli, Research Fellow, BT Centre for Major Programme Management, Saïd Business School, University of Oxford

Alexander Budzier, Researcher, BT Centre for Major Programme Management, Saïd Business School, University of Oxford

Online Course: Fundamental Characterisation for Nanotechnology

28 April–6 July 2014

This tutored, part-time, online course surveys the range of techniques and methodologies available to determine the nature and composition of nanoparticles (both organic and inorganic), thin films and nanostructures. As well as giving a more detailed account of a selection of the most common techniques, the course takes a trouble-shooting approach: beginning with the material/object; identifying the information that is required; formulating an approach to obtaining that information; making a rational choice of techniques and methodologies; and giving due regard to efficiency and cost-effectiveness. Includes the Nano-scale Materials Characterisation weekend in July.



Tutors: Dr Neil P Young, Senior Research Fellow, Department of Materials, University of Oxford
Dr Frank Dillon, ERC Post-doctoral Research Fellow, Department of Materials, University of Oxford

Nanotechnology Summer School – Introduction to Bionanotechnology

30 June–4 July 2014

This five-day course provides an introduction to the exciting and emerging field of bionanotechnology. The first day of the summer school gives an introduction to cell biology and bionanotechnology and is mainly aimed at participants from non-biological disciplines. The following four days focus on bioanalytical techniques; applied genomics and proteomics; nanoparticles, nanostructures and biomimetics; and the interaction of nanomaterials with biological systems, respectively. Each day of the summer school can also be attended as a stand-alone short course.

Course Director: Dr Christiane Norenberg, University of Oxford Begbroke Science Park

Nano-scale Materials Characterisation

5–6 July 2014

This two-day course introduces a variety of techniques for the analysis of nanoparticles, including particle size analysis, electron microscopy and scanning probe microscopy. The course draws upon experts from the Oxford Materials Characterisation Service (OMCS) and consists of practical demonstration sessions and discussions.

Presenters: Dr Alison Crossley, Manager, OMCS, Department of Materials, University of Oxford
Dr Kerstin Jurkschat, OMCS, Department of Materials, University of Oxford and other OMCS staff

Online Course: The Wider Context of Nanotechnology

13 October–30 November 2014

This tutored, online course gives an overview of the current state of nanotechnology as well as outlining the implications of these new technologies for safety, regulation and innovation. It looks at ethical issues in the use of nanotechnologies and investigates their potential societal and environmental impact.

Tutor: Dr Keith Simons, Innovation Director in Emerging Technologies; Owner, KS Associates

Online Course: The Fundamental Science of Nanotechnology

12 January–22 March 2015

This tutored, part-time, online course introduces the fundamental science behind the phenomena that result from the nanometre scale. In particular, the course examines the theoretical foundations of these phenomena and their applications by exploring the mathematical description of these nanoscale phenomena, together with common nanoscale structures, their fabrication, properties and applications, including nanowires, quantum dots and nanoparticles, as well as carbon nanostructures.

Tutors: Dr Christiane Norenberg, Academic Director of the Nanotechnology Programme; Nanotechnology HEIF Manager, University of Oxford Begbroke Science Park

Professor Peter J Dobson OBE, The Queen's College, Oxford

Dr Victor Burlakov, Senior Research Fellow, Linacre College, Oxford

Online Course: Postgraduate Certificate in Nanotechnology

13 October 2014–5 July 2015

The Postgraduate Certificate in Nanotechnology is a tutored, part-time, online course. It comprises the three online courses above, and the Nano-scale Materials Characterisation course as a residential weekend in Oxford, introducing the most commonly used and most important analytical, quantitative and experimental methods in nanotechnology. Participants have access to a rich bank of online resources, and engage in real-time online tutorials.

The course is designed for professionals wishing to study part-time. It will especially appeal to those working in the commercial or healthcare sectors who use, or expect to use, nanotechnology in their work. Graduates of the course include electrical engineers, materials scientists, project managers, patent agents, chemists, medical practitioners, plastic surgeons and food technologists as well as those involved in manufacturing, research and legislation.

Course Director: Dr Christiane Norenberg, University of Oxford Begbroke Science Park



Technology Programme 2014



High-Speed Digital Engineering and EMC

Electronics

Telecoms and Mobile Technologies

Systems Engineering

Management Skills for Engineers and Scientists

Nanotechnology

HOW TO REGISTER:

1. **Online:** immediate online registration is available from the relevant course webpage (credit / debit / bank card required)
2. **Purchase order:** download an application form from the course webpage, complete and return to us along with a copy of the company purchase order and we'll issue an invoice
3. **Bank transfer (BACS):** download an application form from the course webpage, complete and return to us along with details of the bank transfer payment and we'll send a receipt
4. **Cheque:** download an application form from the course webpage, complete and return to us along with cheque payable to O.U.D.C.E. in pounds sterling
5. **Telephone:** call us on 01865 286958 (from UK) or +44 1865 286958 (from outside UK)
6. **Email:** technology@conted.ox.ac.uk

We accept the following cards: Visa, Visa Debit, Visa Electron, Mastercard, Maestro

PAYMENT

The course fee covers as a minimum: tuition, course notes, lunches and daytime refreshments for the duration of the course (regarding inclusions for online courses, see website). Reference books/textbooks are also provided on some courses. See the relevant course page for further details. Accommodation is NOT included. Please see the "Accommodation" link on our website for details of how to book accommodation at our Residential Centre. Please note our courses are VAT exempt.

DISCOUNTS

Details of multiple registration discounts and any other discounts available for each course are shown on the website. Discounts may only be claimed at the time of registration.

WHAT HAPPENS WHEN YOU HAVE REGISTERED

We will confirm your application by email. You will then receive joining instructions by email (unless you request otherwise) giving course times, maps and travel information approximately two weeks before the start of the course.

FURTHER INFORMATION

If you require any further information about our courses, registration or anything else in this brochure, please email or phone us. Email: technology@conted.ox.ac.uk
Tel: 01865 286958 (from UK) or +44 1865 286958 (from outside UK)

TERMS AND CONDITIONS

Please see the relevant course web page for our full terms and conditions. www.conted.ox.ac.uk/technology



Continuing Professional Development Centre
Department for Continuing Education
University of Oxford, Rewley House
1 Wellington Square, Oxford OX1 2JA, UK

Tel: +44 (0) 1865 286958 Fax +44 (0) 1865 286934

Email: technology@conted.ox.ac.uk

www.conted.ox.ac.uk/technology



Further lifelong-learning opportunities: www.conted.ox.ac.uk