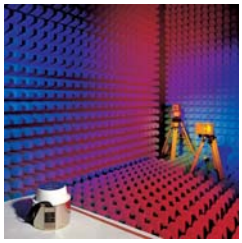
CPD

THE UNIVERSITY of York

Continuing Professional Development and Training Courses in Electronics





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The EE Endorsed® Provider

EMCIA The EMC Industry Association

Member Railway Industry Association

EMCTLA EMC Test Labs Association

ABHI Association of British Healthcare Industries

York EMC Services Ltd

CPD

THE UNIVERSITY of York

Welcome to the new edition of our Electronics CPD and Training Brochure. You will find that it incorporates both established and newly developed courses from the Department of Electronics and York EMC Services Ltd.

Established courses are regularly revised and updated with legislative and technical updates. This year courses will include the new EMC Directive and the EMF Directive.

New courses are concerned with the Human Environment such as Acoustics in Buildings, EMF and the Healthcare environment and with new areas of technology that are researched at York, such as nanotechnology.

The level of each course is indicated; from introductory and awareness briefings through to advanced courses at postgraduate level.

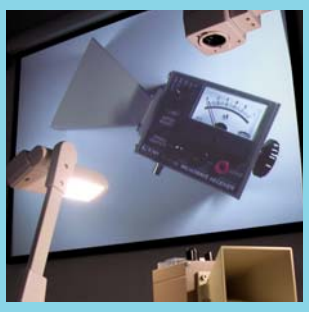
Courses are designed for different business sectors eg Railways; Automotive; Medical; Building & Construction; Communications and Military.

Quality Assurance
The CPD Programme operates within a quality assurance scheme in accordance with ISO 9001.

Course venues
Courses take place at the University of York in our designated teaching room with state-of-the-art presentation and computing equipment and a hearing loop facility. Other specialised facilities on the campus are also used.
Courses also take place at the York EMC Services Ltd accredited Test Laboratory at Castleford which is equipped to the same high standard.

A full set of course notes will be provided for each participant. They are updated annually and provide a substantial and comprehensive reference document. They are prepared specifically by each lecturer for the course that is being taken.

In–house and bespoke courses can be designed to your company's requirement. Please contact the CPD Office to discuss your specification.



York EMC Services Ltd is a wholly owned subsidiary company of the University of York that also provides EMC and LVD testing, research and consultancy and EMC test equipment. Details can be found on pages 31 and 32 or at www.yorkemc.co.uk

Disclaimer: The courses in this brochure are continually updated and amended, and although courses will not be significantly altered, the details enclosed in this brochure may be subject to change.

CPD

THE UNIVERSITY of York

Continuing Professional Development and Training Courses in Electronics

2006/2007

CONTENTS

The level and length of each course is indicated below

Key: b awareness briefing i introductory course w interactive workshop a advanced level

THE NEW EMC DIRECTIVE 2004/108/EC – A BRIEFING

Length:	0.5 day
Level:	b Briefing

Background – the industry context and issues relevant to the course

The EMC Directive 89/336/EEC was published in 1989 and will be repealed in July 2009, it will be superseded by 2004/108/EC in July 2007. The new EMCD has resulted from the work of the SLIM committee in 1998, which sought to clarify and simplify the EMCD. The new EMCD does clarify the application in many cases, removes the mandatory requirement to use a Competent Body, but also requires a manufacturer to have more robust EMC documentation.

Key subjects covered

- The scope of 2004/108/EC
- The Essential Requirements
- Conformity assessment procedures and use of harmonised standards
- The role of the Notified Bodies (renamed Competent Bodies)
- Requirements for fixed installations
- Information and outline of Documentation requirements

Course scope

The requirements of the new EMCD will be presented and the changes to existing requirements highlighted. The definitions of components, apparatus and fixed installations will be presented. The Essential Requirements will be described and the conformity assessment procedures, including the EMC Assessment. The role of the Notified Bodies will be discussed. The fixed installation and associated EMC issues will be discussed. An outline will be presented of the information and technical documentation requirements.

Venue

The University of York
York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK
York EMC Services Ltd UKAS accredited Test Laboratory at Donibristle, Fife, Scotland

Mode of delivery

Lectures with powerpoint presentations, optional EMC laboratory tours

Who should attend

EMC Assurance Managers/Engineers, Engineering Directors, Engineering Managers, Electronics Design Engineers, QA Managers, Facilities Managers (fixed installations)

Presenters

Mr Chris Marshman, York EMC Services Ltd
Mr Nick Wainwright, York EMC Services Ltd
Mr Andy Rowell, York EMC Services Ltd
or Mr David Hambley, York EMC Services Ltd

Other related courses that may interest you

EMC Technical Documentation; EMC Regulations, Standards and Management

FUNDAMENTALS OF DESIGN AND TESTING FOR EMC

Length:	5 days
Level:	i Introductory course

Background – the industry context and issues relevant to the course

An understanding of EMC is essential for the reliable operation of electrical/electronics equipment and systems in, for example commercial, automotive, aerospace or defence markets.
The knowledge and understanding from this course can be applied to the cost effective management of EMC, minimising additional costs and production delays in equipment.
It is illegal to sell or operate electronic equipment or systems that are not compliant with the EMC Directive within the European Economic Area.
EMC: Fundamentals of Design & Testing is a highly recommended, unique five-day course that will provide you with the essential knowledge required to help manage EMC and achieve EMC compliance with specifications, standards or legal requirements. We have provided EMC CPD to industry for over 20 years and this is the course from our portfolio that we would recommend for those with little or no EMC experience.

Key subjects covered

- Fundamentals of EMC
- An introduction to the EMC Directive, the 'New' EMC Directive, relevant EMC standards and related issues
- EMC Measurements and Testing
- Designing for EMC

Course scope

- EM Phenomena and EM environments
- Conformance requirements of the EMC Directive 89/336/EEC and its UK implementation SI 2005 281
- The New EMC Directive 2004/108/EC
- Understanding standards: IEC, CISPR, CENELEC, BSi, etc
- The key emissions and immunity tests to meet compliance requirements
- The EMC test equipment, EMC measurements: techniques, repeatability and uncertainty
- EMC Design techniques: filters, interfaces, PCBs, minimising cable crosstalk, screening and shielding, grounding and earthing
- The principles of EMC Management: the control plan, test plans

Venue

The University of York and also York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK

Mode of delivery

The course is delivered as a series of integrated lectures, case studies, demonstrations and an all-day EMC Testing practical workshop at our UKAS accredited Castleford EMC Test Centre. The course is supported by a set of specifically prepared book quality course notes.

Who should attend

Our courses are attended by personnel from SMEs, large industrial companies, multi-nationals, the Armed Forces and

Government agencies around the world.
Practising engineers of MEng/BEng/BSc/HNC level
Managers concerned with the design, manufacture and testing of electrical/electronic products
Managers responsible for setting EMC requirements
Engineers/managers involved in the designing of EMC test facilities or procuring third party services

Presenters
Mr Chris Marshman, York EMC Services Ltd
Prof Andy Marvin, Department of Electronics, University of York
Mr Nick Wainwright, York EMC Services Ltd
Dr Martin Robinson, Department of Electronics, University of York
Dr David Welsh, York EMC Services Ltd
Dr John Dawson, Department of Electronics, University of York
Dr Stuart Porter, Department of Electronics, University of York
Mr Paul Duxbury, Flomerics

Other related courses that may interest you
Advanced EMC Design; Advanced EMC Measurements and Testing; Advanced Shielding and Filtering; Electrostatic Discharge and Transients; Design Filtering and Shielding for EMC 1 and 2

REVERBERATION CHAMBERS FOR EMC

Length:	1 day
Level:	i Introductory course

Background – the industry context and issues relevant to the course
The frequency of operation of electronic devices and wireless communications is steadily increasing into the GHz range. Whilst a range of EMC measurement techniques exist for use in the frequency range up to 1GHz, new measurement techniques are required above 1GHz. The reverberation chamber is one such technique. It offers the capability to perform emissions and immunity measurements from a few hundred MHz upward, a larger working volume than possible in conventional (semi-) anechoic chambers and absorber lining is not required.

High field strengths are achievable with lower power than conventional anechoic chambers. The reverberation chamber illuminates a test object with equal energy from all directions and with all polarisations ensuring that a thorough immunity test is performed.
For emissions measurements the reverberation chamber measures total radiated power. This avoids the need to determine the direction of maximum emissions which becomes increasingly difficult at frequencies above 1GHz due to the possible high directivity of test objects and the difficulty of performing measurements in the far field pattern.

Key subjects covered
- Why use a reverberation chamber – comparison with other measurement systems such as OATS, Anechoic chamber, GTEM cell etc.
- Principles of Reverberation chambers – how does it work and what does it do?
- Introduction to measurements using “International Electrotechnical Commission, 61000-4-21 ELECTROMAGNETIC COMPATIBILITY (EMC), Part 4: Testing and Measurement Techniques, Section 21: Reverberation Chamber Test Methods”
- Measurement of shielding of enclosures and cables in a reverberation chamber.

Course scope
This course covers the operation of reverberation chamber for emissions and immunity measurements. The principles are presented through lectures with associated demonstrations.

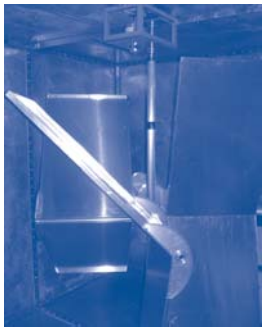
Venue
The Department of Electronics, University of York; CPD Teaching room and EMC Reverberation chamber

Mode of delivery
50% lecturers, 50% laboratories. Each delegate will receive a set of notes as a reference document.

Who should attend
EMC test engineers and managers
Researchers performing EMC measurements

Presenters
Dr John Dawson, Department of Electronics, University of York
Other presenters may include, Prof Andy Marvin, Dr Martin Robinson and/or Dr Linda Dawson, Department of Electronics, University of York

Other related courses that may interest you
EMC Testing Workshop; Design for EMC; Validation, Verification and Measurement Workshop; Advanced EMC Measurements and Testing; RF & Microwave Circuit Design



DESIGN FOR EMC

Length:	1 day
Level:	W Interactive workshop

Background – the industry context and issues relevant to the course

Consideration of EMC at the early stages of a project or product development can lead to significant savings in time and money during the final approvals process. It is therefore important that engineers and technicians involved in the design process are aware of the techniques available to reduce the risk of non-compliance.

Key subjects covered

- Cable shielding
- Crosstalk
- Enclosure shielding
- Filters
- Grounding
- Layout
- Protection components

Course scope

The course provides a comprehensive introduction to the concepts and practical techniques that should be applied in the design process in order to successfully achieve EMC. Lecturers on the workshop are all active in the fields of EMC research and application with many years of accumulated experience.

Venue

The University of York

Mode of delivery

This is a one-day workshop comprising presentations and practical demonstrations.
Each delegate will receive a set of workshop notes as a reference document.

Who should attend

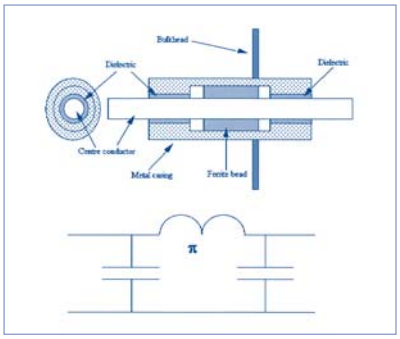
Electronic design engineers wishing to improve their understanding of EMC. EMC test engineers wishing to improve their capability in solving EMC problems.

Presenters

Dr John Dawson, Department of Electronics, University of York
Dr Martin Robinson, Department of Electronics, University of York
Dr David Welsh, York EMC Services Ltd

Other related courses that may interest you

EMC Testing Workshop; Advanced EMC Design; Design Filtering and Shielding for EMC 1 and 2



EMC TECHNICAL DOCUMENTATION

Length:	1 day
Level:	W Interactive workshop

Background – the industry context and issues relevant to the course

In order to conform to the EMC Directive and the implementing legislation manufacturers are required to produce technical documentation in order to apply the CE Marking. Under 89/336/EEC the documentation is confined to the Declaration of Conformity (DoC) and when appropriate a Technical Construction File (TCF). For the 'new' EMCD 2004/108/EC effective from July 2007 all manufacturers will be required to carry out an EMC assessment, produce EMC technical documentation in addition to the DoC, in effect a TCF, as well as information on the installation and use of the equipment. 2004/108/EC also requires the 'good engineering practices' used in Fixed Installations to be documented.

Key subjects covered/Course scope

- Routes to compliance with 89/336/EEC
- What is a TCF? When should it be used? What should it contain?
- How to compile a TCF
- The role of the Competent Body
- Compliance with 2004/108/EC
- The EMC assessment
- EMC technical documentation
- Installation and user information
- The role of the Notified Body
- Documentation for the Fixed Installation

Venue

The University of York
York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK
York EMC Services Ltd UKAS accredited Test Laboratory at Donibristle, Fife, Scotland
Customer site

Mode of delivery

Lectures with Powerpoint and practical interactive sessions.
Each delegate will receive a set of workshop notes as a reference document.

Who should attend

All those involved with EMC approvals documentation: Engineering Directors, Approvals Engineers, Engineering Managers, Quality Managers and Engineers.

Presenters

Mr Chris Marshman, York EMC Services Ltd
Mr David Hambley, York EMC Services Ltd
Mr Andy Rowell, York EMC Services Ltd
Mr Nick Wainwright, York EMC Services Ltd

Other related courses that may interest you

EMC Testing Workshop; Design for EMC; Advanced EMC Measurements and Testing; Advanced EMC Design; Design Filtering and Shielding for EMC 1 and 2

EMC TESTING

Length:	2 days
Level:	W Interactive workshop

Background – the industry context and issues relevant to the course

All electrical and electronic equipment should be assessed against the essential requirements of the European EMC (Electromagnetic Compatibility) Directive as part of the process necessary to affix the CE marking. Most manufacturers will carry out a practical EMC assessment on their equipment either by using their own test facilities or using a third party accredited laboratory.

For engineers involved in designing electronic equipment it is advantageous to have a working knowledge of EMC and the EMC tests to which that equipment will be subjected. Such knowledge will similarly be an advantage to engineers accompanying their equipment to third party laboratories as well as those performing measurements using in-house facilities.

Key subjects covered

- An introduction to EMC
- Measurement environments
- EMC standards
- Common emission tests
- Common immunity tests
- Accredited, compliance, pre-compliance and post compliance testing
- Practical EMC testing

Course scope

This two day workshop aims to provide delegates with an understanding of the basics of EMC, the EMC Directive and the principal EMC tests. It also provides an insight into the different levels of EMC testing and how they can be most effectively used throughout the compliance process.

Day one consists of a series of presentations introducing EMC, EMC standards and the type of EMC tests that are commonly performed.

Day two consists of a series of interactive demonstrations in the laboratory showing how the principal EMC tests are carried out and the test equipment required. These demonstrations are carried out in the UKAS accredited laboratory using the test equipment that is normally used to perform accredited measurements. Small groups allow full interaction with experienced EMC test personnel.

Venue

York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK

Mode of delivery

This is a two-day workshop comprising presentations and practical demonstrations.
Each delegate will receive a set of workshop notes as a reference document.

Who should attend

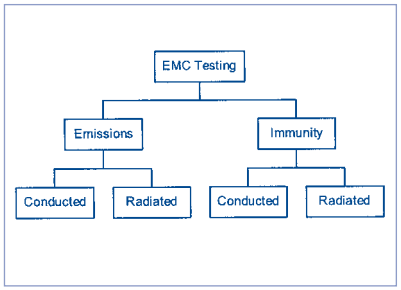
This workshop will be of particular interest to engineers and technicians who are designing electronic equipment to meet the requirements of the EMC Directive as well as those who are involved in the approvals process in general and EMC compliance in particular.

Presenters

Mr Nick Wainwright, York EMC Services Ltd
Mr Darren Hayes, York EMC Services Ltd
Mr Andy Rowell, York EMC Services Ltd

Other related courses that may interest you

Validation, Verification and Measurement Workshop; Design for EMC; Fundamentals of Design and Testing for EMC; Advanced EMC Design



THE PRACTICAL APPLICATION OF VALIDATION, VERIFICATION AND MEASUREMENT UNCERTAINTY TECHNIQUES TO EMC TESTING IN ACCORDANCE WITH ISO17025

Length:	1 day
Level:	W Interactive workshop

Background – the industry context and issues relevant to the course

All accredited testing and calibration laboratories operate in accordance with ISO17025 which has, as one of its central requirements, the need to "assure the quality of the result" by validating and verifying test equipment and test set-ups.

This workshop aims to show how this can be achieved in a practical and cost effective manner and how it can be used to increase the overall confidence in the measurements made.

ISO17025 also requires laboratories to produce uncertainty budgets for each accredited test. The workshop aims to dispel some of the myths of uncertainties and show, practically, how relevant uncertainty budgets can be calculated.

Key subjects covered

- Introduction to ISO17025
- The need to calibrate test equipment
- Validating test equipment and methods
- Reducing the risk through verification
- Introduction to measurement uncertainty in EMC testing
- Application of uncertainty to emission tests
- Application of uncertainty to immunity tests

Course scope

The course aims to provide delegates with an understanding of the validation, verification and measurement uncertainty requirements placed on EMC laboratories by ISO17025.
It should also enable delegates to implement validation and verification systems and enable delegates to develop measurement uncertainty budgets.

Venue

York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK

Mode of delivery

This is a one-day workshop comprising presentations and practical demonstrations.
Each delegate will receive a set of workshop notes as a reference document.

Who should attend

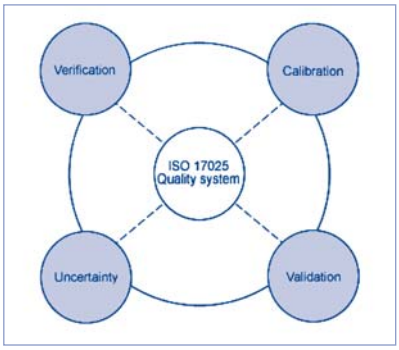
This workshop will be of particular interest to engineers working in accredited laboratories, working in a laboratory aspiring to be accredited or those simply wishing to reduce the risk of invalid measurements being produced.

Presenters

Mr Nick Wainwright, York EMC Services Ltd
Mr David Hambley, York EMC Services Ltd
Mr Darren Hayes, York EMC Services Ltd
Mr Andy Rowell, York EMC Services Ltd

Other related courses that may interest you

EMC Testing Workshop; Design for EMC; Fundamentals of Design and Testing for EMC; Advanced EMC Design; Design Filtering and Shielding for EMC 1 and 2



ADVANCED EMC DESIGN

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

All electronic equipment must operate in the presence of sources of interference such as radio transmitters, electrostatic discharge etc. and so must be immune to reasonable levels of interference. With an increase in wireless communications (e.g. mobile phones, wireless networking) there is an increasing likelihood of interference to the communications systems from other electronic equipment and a greater number of transmitters operating near potentially sensitive electronic equipment. It is therefore vital that equipment designers understand the electromagnetic behaviour of electronic systems and are able to design electromagnetic compatibility in to products. This has been shown to be much more cost effective than fixing problems with a finished product. This course aims to equip designers to understand the issues and solutions in circuit and system design.

Key subjects covered

- Design of circuits and systems to reduce generation of and susceptibility to EMI
- Design of systems to comply with the EMC Directive
- Components at high frequency including filters, suppressors, and isolation components
- Circuit effects (generation and susceptibility to EMI) in analogue, digital and power switching circuits
- Radiation and coupling mechanisms
- Physical layout including PCB layout for high speed digital circuits and analogue systems, effects of grounding, and wiring harnesses

- Cable and enclosure screening including apertures and imperfections
- System design.
- CAD for EMC an overview of what computational tools can and can't do for designers

Course scope
This in-depth course demonstrates how electronic systems behave from the point of view of the EMC Engineer; building from the behaviour of simple components, through circuit and system design. By understanding the implications of Electromagnetic Compatibility on circuit and system design, with a few simple calculations and application of design rules, many EMC problems can be avoided before the system goes to test.

Venue
The University of York

Mode of delivery
The course is split between lecture (approx 40%) and laboratory work (approx 60%). The laboratory is split between simulation and measurement of example systems.
The course is supported by a set of specifically prepared book quality course notes.
This course is not scheduled to run after January 2006. It will be superseded by Design, Filtering and Shielding for EMC Module 1.

Who should attend
Design engineers and managers who are responsible for product design. A basic knowledge of EMC standards and measurements is required.

Presenters
Dr John Dawson, Department of Electronics, University of York
Dr Tad Konefal, Department of Electronics, University of York
Dr Stuart Porter, Department of Electronics, University of York
Dr Martin Robinson, Department of Electronics, University of York
Dr David Welsh, York EMC Services Ltd

Other related courses that may interest you
Advanced Shielding and Filtering, Design Filtering and Shielding for EMC 1 and 2

ADVANCED EMC MEASUREMENTS AND TESTING

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course
This course is primarily aimed at engineers undertaking EMC testing with a view to extending their understanding of the complex issues involved. Whilst EMC measurements are generally performed by specialists in EMC test houses, the engineers whose equipment is tested will also benefit from this course by extending their understanding of the tests performed on their equipment.

Key subjects covered
Lectures:
- Fundamentals of the measurement process
- Effects of non-linearities
- Measurement uncertainties
- Electromagnetic energy propagation and coupling mechanisms
- The man-made and natural electromagnetic noise environment
- Anechoic chambers and absorbing materials
- Screened rooms and mode-stirred chambers
- Open-area test sites and TEM Cells
- Conducted EMI measurements
- Electrostatic discharge measurements

Practical work:
- Radiated Emission measurements
- Radiated Immunity measurements
- Non-linear devices
- Observation of the radio spectrum

Course scope
This in-depth course illustrates a wide range of electromagnetic compatibility (EMC) measurements and introduces the techniques associated with performing electromagnetic compatibility measurements in a variety of test environments.

Venue
The University of York and the York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK

Mode of delivery
This is a lecture/laboratory based course. The course is supported by a set of specifically prepared book quality course notes.

Who should attend
Engineers who are making, or specifying EMC measurements. Design engineers and others wishing to understand the EMC measurement process.

continued

Presenters
Prof Andy Marvin, Department of Electronics, University of York
Dr John Dawson, Department of Electronics, University of York
Mr Chris Marshman, York EMC Services Ltd
Dr Ian Noble, Engineering Consultant

Other related courses that may interest you
EMC Testing Workshop

ADVANCED SHIELDING AND FILTERING

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course
Shielded enclosures are widely used in electronic products to improve their EMC performance – they act as a barrier to electromagnetic energy, thus reducing radiated emissions and also improving susceptibility to electric and magnetic fields. A sound knowledge of the physical principles of shielding over a wide range of frequencies is needed to ensure well-designed and cost-effective shielded enclosures.

Key subjects covered
- Basic shielding theory: models of Schelkunoff, Kaden and Circuit Model
- Influence of thickness of materials and frequency
- Difference in shielding between flat material samples and enclosures
- Effects of holes, slots and joints
- Gaskets
- Architectural shielding
- Measuring set-ups for shielding effectiveness (SE) of flat samples under near-field and far-field conditions
- Standards for measurements (ASTM, MIL STD and NSA)
- Measuring set-ups for SE of small enclosures
- Shielding of cables
- Transfer impedance of shielded cables: concept and measuring standards
- Bridging of shielded structures by conducted phenomena and use of filters
- New research on shielding

Course scope
The course introduces the theory and techniques of shielding materials, shielding measurements and the design of shielded enclosures in practice. This includes filtering, when needed for avoiding conducted EMC problems.

Venue
The University of York

Mode of delivery
This is a lecture and laboratory based course.
The course is supported by a set of specifically prepared book quality course notes.
This course is not scheduled to run after October 2006. It will be superseded by Design, Filtering and Shielding for EMC Module 2.

Who should attend
Engineers who require an understanding of the theory and techniques of shielding materials, shielding measurements and the design of shielding enclosures in practice.

Presenters
Prof Johan Catrysse, Katholieke Hogeschool Brugge Ostende, Belgium
Dr Myles Capstick, Department of Electronics, University of York
Prof Andy Marvin, Department of Electronics, University of York
Dr Martin Robinson, Department of Electronics, University of York

Other related courses that may interest you
Principles of Transmission Lines, Crosstalk and Cable Screening; RF & Microwave Circuit Design; Advanced EMC Design; Fundamentals of Design and Testing for EMC

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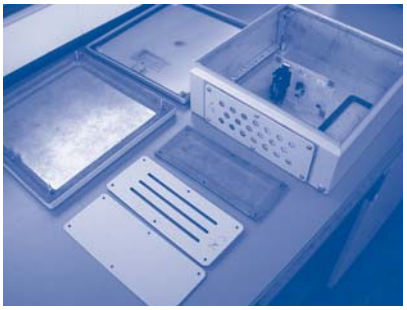


COMPUTATIONAL ELECTROMAGNETICS

FREQUENCY DOMAIN TECHNIQUES

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

Understanding and prediction of electromagnetic wave phenomena is now key to successful design for RF systems and EMC compliance. With modern desktop computing resources, frequency domain numerical electromagnetic techniques can significantly enhance understanding and provide reliable predictive capabilities across a wide range of problems, including those indicated below in the course subject material.

Key subjects covered

- Frequency domain integral (moment method) and differential (finite element) equation based techniques for predicting electromagnetic scattering from wire antennas/structures and conducting objects
- Three dimensional modelling using moment method and finite element method of antennas in free space and over ground planes, including mutual coupling, antenna factors and use of antennas for EMC testing
- Two-dimensional modelling using finite element method of conducting structures related to EMC

Course scope

This course aims to give the delegate an appreciation of the uses and limitations of frequency domain computational techniques applied to EMC and RF problems. The module gives the delegate a thorough grounding in the methodology of these techniques from a fundamental standpoint, while giving a grasp of the practical applications. Simple problems are considered to give an understanding of how the choices made in designing the algorithms translate into the real strengths and limitations of the software. More complex EMC and RF antennas/structures and real EMC test environments are considered to give an insight into current and potential uses.

Venue

The University of York

Mode of delivery

The course structure comprises approximately 40% lectures, 60% laboratory work with the final part of the course dedicated to working on realistic case studies.
The course is supported by a set of specifically prepared book quality course notes.

Who should attend

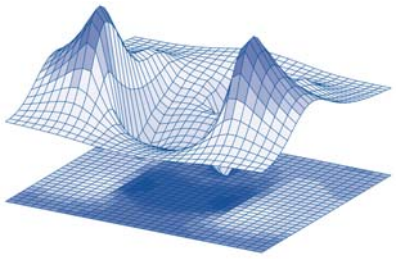
Engineers responsible for production or use of numerical modelling techniques. Engineers involved in EMC testing or EMC/RF antenna design who wish to gain an appreciation of the role of modelling within those areas.

Presenters

Dr Stuart Porter, Department of Electronics, University of York
Dr John Dawson, Department of Electronics, University of York

Other related courses that may interest you

Computational Electromagnetics: Time Domain Techniques



TIME DOMAIN TECHNIQUES

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

With the rapid increase in performance of desktop computers it has become feasible for designers to apply computational electromagnetics to determine the electromagnetic behaviour of many systems without the need for supercomputing facilities. Examples range from enclosure shielding, emissions from heatsinks, propagation of electromagnetic energy into living tissue (eg. mobile phones, medical diathermy), antenna design, printed circuit board layout, connectors and cables. Supercomputers have been used to analyse the performance of modern aircraft such as the Eurofighter Typhoon, and complex measurement environments such as reverberation chambers.
The course aims to present the principles behind time-domain numerical electromagnetic codes and illustrate what the can and cannot do. A full set of demonstration software is provided.

Key subjects covered

- Time domain modelling of electromagnetic scattering
- Finite difference time domain (FDTD) and transmission line matrix (TLM) modelling of enclosures, antennas, and guided waves
- Examination of boundaries wires, thin-layers (ferrite, CFC) and other macro-models used within finite methods
- Time domain integral equation based modelling of wire structures and antennas
- Post processing techniques including conversion from time domain to frequency domain will also be addressed.

Course scope

This course aims to give the delegate an appreciation of the uses and limitations of time domain computational techniques applied to EMC and RF problems. The course gives the delegate a thorough grounding in the methodology of these techniques from a fundamental standpoint, while giving a grasp of the practical applications. Simple problems are considered, in lectures and practical sessions, to give an understanding of how the choices made in designing the algorithms translate into

the real strengths and limitations of the software. More complex EMC and RF antennas/structures and real EMC test environments are then examined to give an insight into current and potential uses.

Venue
The University of York

Mode of delivery
Extensive practical work will be used to illustrate the theory, uses, and limitations of the computational techniques. The module is split between lecture (40%) and laboratory (60%). The final part of the module is spent working on realistic case studies. Students will be issued with functional software that can be used for the assignment and other work.

The course is supported by a set of specifically prepared book quality course notes.

Who should attend
Engineers involved in EMC design and testing, design of EMC test cells or enclosures, and EMC/RF antenna designers who wish to gain an appreciation of the role of modelling within those areas. Engineers currently using numerical modelling techniques who wish to gain a grounding in the theory, and update their knowledge of the topic.

Presenters
Dr John Dawson, Department of Electronics, University of York
Dr Stuart Porter, Department of Electronics, University of York

Other related courses that may interest you
Computational Electromagnetics: Frequency Domain Techniques; Introduction to Computational Electromagnetics, Distance learning package with CD

AN INTRODUCTION TO COMPUTATIONAL ELECTROMAGNETICS

A Distance learning package with CD
Over the past few years CEM has evolved into a separate and important discipline, with applications in Radar Cross Section prediction, Electromagnetic Compatibility (EMC), Communications Technology and Remote Sensing. It is a multi-disciplinary subject, combining the mathematics of vector calculus and numerical analysis with the physics of wave generation and propagation together with an appreciation of computer science and information technology.

Course scope
This course aims to unify the separate aspects of CEM into a self contained package, suitable for retraining or refresher courses for staff with backgrounds in electronics, physics or mathematics.
The course is based on the well established four-day intensive introductory course, which comprises lectures, demonstrations and laboratory sessions.
A thorough development of the fundamentals of each method is provided. Building on this, the associated laboratories show examples of the advantages and disadvantages of using computers for field calculations and allow an exploration of some of the techniques in more detail. The aim is to give an understanding of the strengths and limitations of the techniques from a practical viewpoint.

Summary of course content
- Introduction and Background Theory
- Integral Equation Methods in CEM
- Finite Techniques in CEM
- Transmission Line Matrix Modelling
- Overview of High Frequency Techniques
- Processing and Interpretation
- Laboratory Sessions

Materials provided
- Complete set of course notes
- Laboratory scripts for the associated laboratories.
- All software and examples required to complete the laboratory scripts, including integral equation, finite difference, and transmission line matrix packages, provided on CD-ROM

Potential Users
Engineers, Scientists, and Technical Managers. No programming skills are required but familiarity with Windows 95 (or newer) and the PC environment is advised.

DESIGN, FILTERING AND SHIELDING FOR EMC 1

Length:	2.5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course
This course and its companion course Design, Filtering and Shielding for EMC 2 form a five day advanced course that covers aspects of electronic hardware design, at the circuit design, circuit layout and mechanical levels, necessary to achieve EMC and Signal Integrity. This course covers circuit aspects and the second covers shielding and mechanical aspects.

Key subjects covered
- Design of circuits and systems to reduce generation of and susceptibility to EMI
- Design of systems to comply with the EMC Directive
- Components at high frequency including filters, suppressors, and isolation components
- Circuit effects (generation and susceptibility to EMI) in analogue, digital and power switching circuits
- Radiation and coupling mechanisms
- Physical layout including PCB layout for high speed digital circuits and analogue systems, effects of grounding, and wiring harnesses
- Cable and enclosure screening including apertures and imperfections
- System design
- CAD for EMC an overview of what computational tools can and can't do for designers

Course scope
This course demonstrates how electronic systems behave from

the point of view of the EMC Engineer; building from the behaviour of simple components, through circuit and system design. By understanding the implications of Electromagnetic Compatibility and signal integrity on circuit and system design, with a few simple calculations and application of design rules, many EMC problems can be avoided before the system goes to test.

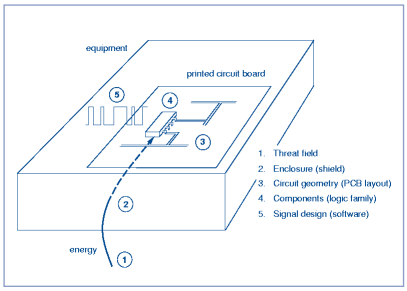
Venue
The University of York

Mode of delivery
The material is delivered by lectures and hands-on demonstrations. Delegates will receive a set of course notes as a reference document.

Who should attend
Engineers needing to update their hardware design skills to cope with the challenges of modern high speed electronic design. A basic knowledge of EMC standards and measurements is required.

Presenters
Dr John Dawson, Department of Electronics, University of York
Dr Tad Konefal, Department of Electronics, University of York
Dr Stuart Porter, Department of Electronics, University of York
Dr Martin Robinson, Department of Electronics, University of York
Dr David Welsh, York EMC Services Ltd

Other related courses that may interest you
Design, Filtering and Shielding for EMC 2



DESIGN, FILTERING AND SHIELDING FOR EMC 2

Length:	2.5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course
This course and its companion course Design, Filtering and Shielding for EMC 1 form a five day advanced course that covers aspects of electronic hardware design, at the circuit design, circuit layout and mechanical levels, necessary to achieve EMC and Signal Integrity. This course covers shielding and mechanical aspects and course 1 covers circuit aspects.

Key subjects covered
- Basic shielding theory: models of Schelkunoff, Kaden and Circuit Model
- Difference for shielding between flat material samples and enclosures
- Effect of holes, slots and joints
- Architectural shielding
- Measuring setups for shielding effectiveness of flat samples under near field and far field conditions
- Standards for measuring (ASTM, MIL STD and NSA)
- Measuring setups for small enclosures
- Characterisation of gaskets
- Shielding of cables and shielded cables, Transfer Impedance

Course scope
The course uses basic circuit design and electromagnetic concepts to illustrate the fundamental principles of hardware design needed to achieve EMC and Signal Integrity.

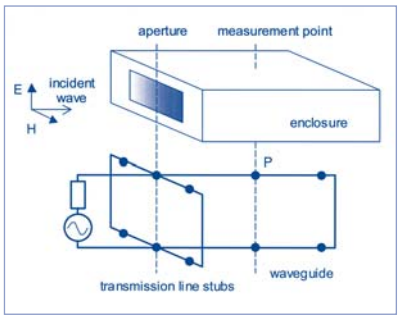
Venue
The University of York

Mode of delivery
The material is delivered by lectures and hands-on demonstrations. Delegates will receive a set of course notes as a reference document.

Who should attend
Engineers needing to update their hardware design skills to cope with the challenges of modern high speed electronic design.

Presenters
Dr John Dawson, Department of Electronics, University of York
Prof Johan Catrysse, Katholieke Hogeschool Brugge Ostende, Belgium
Dr Stuart Porter, Department of Electronics, University of York
Dr Martin Robinson, Department of Electronics, University of York

Other related courses that may interest you
Design, Filtering and Shielding for EMC 1



EMC REGULATIONS, STANDARDS AND MANAGEMENT

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

When electromagnetic compatibility is not considered from the concept stage of an electrical/electronics project there exists the potential for electromagnetic interference to occur which may result in either mal operation of existing equipment in the operating environment or of the equipment being introduced. In the worst case scenario the safety of equipment will be compromised.

Hence EMC must be considered as an aspect of the safety and product reliability. EMC is regulated in Europe by implementation of the EMC Directive. Equipment found failing to comply with the regulations can be excluded from the market and result in prosecution of manufacturers.

EMC can be achieved cost effectively by managing EMC from a project concept, through completion, to end of life.

Key subjects covered

- The EMC Directive 89/336/EEC: Protection Requirements; Routes to Compliance; Declaration; Scope of the EM Directive; Responsibility of Member States
- The UK EMC Regulations SI 2005 No.281: Enforcement authorities; offences and penalties; Defence of due diligence
- The new EMC Directive 2004/108/EC: what are the changes, what will manufacturers need to do?
- Engineers Legal Responsibilities
- The Automotive EMC Directive, EMC aspects of the Medical Devices Directive and the R&TTE Directive
- EMC Standards: Standards Route to Compliance; Product-specific; Generic and Basic Standards concepts are discussed
- The Technical Construction File: Contents; Applications.
- Military Standards
- EMC Test Facilities: Measurement Environments; Practical OATS; the screened room/anechoic chamber; pre-compliance and low cost testing
- EMC Management: Impact of Regulations; Company EMC Strategy; at project level the EMC Management or Control Plan; EMC Test Plan; Design Management; the formal integration of EMC into the Product development process and product life-cycle

Course scope

The objectives of this module are to provide an understanding of EMC regulatory and standards issues that may then be applied to products, or systems, enabling the appropriate EMC management strategies to be identified taking into consideration the resulting commercial effects.

Venue

The University of York

Mode of delivery

This is a lecture/laboratory based course.
The course is supported by a set of specifically prepared book quality course notes

Who should attend

Decision makers and those who advise decision makers, engineering managers/directors, approvals engineers, product managers and engineers, marketing directors.

Presenters

Mr Chris Marshman, York EMC Services Ltd
Prof Andy Marvin, Department of Electronics, University of York
Mr Nick Wainwright, York EMC Services Ltd
Dr Ian Noble, Engineering Consultant to the Automotive Industry
Mr Ian Cutler, ABHI, Regulatory Affairs Consultant to the Medical Device Industry
Mr Dai Davis, Solicitor, Nabarro Nathanson
Mr Jim Wood, EMC Compliance Ltd

Other related courses that may interest you

Advanced EMC Design, Advanced EMC Testing
EMC Design Workshop, EMC Testing Workshop

PRINCIPLES OF ANTENNAS

Length:	2 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

Antennas are found in all radio based communications systems and the properties and performance of the antennas is a key determinant in the design of much of the rest of the system. This course on antennas describes the properties of antennas as system elements and illustrates the principles with descriptions of a selection of commonly encountered antenna types.

Key subjects covered

- Antenna parameters, gain, beamwidth, aperture, directivity, efficiency etc.
- The physics of the radiation mechanism
- Antennas in reception, Antenna noise properties
- The Friis transmission equation
- Array antennas
- Aperture antennas

- Broadband antennas
- Circularly polarised antennas.

Course scope
The module uses basic ideas of electromagnetics and communications systems to describe the operation of antennas in a communications system.

Venue
The University of York

Mode of delivery
This is a lecture based course with classroom demonstrations. Delegates will receive a set of course notes as a reference document.

Who should attend
Engineers needing to appreciate the operation of antennas in a modern communications environment. This course does not cover antenna design.

Presenters
Prof Andy Marvin, Department of Electronics, University of York

Other related courses that may interest you
Principles of Engineering Electromagnetics; Introduction to Radio Propagation; Computational Electromagnetics: Frequency Domain Techniques; Computational Electromagnetics: Time Domain Techniques

PRINCIPLES OF ENGINEERING ELECTROMAGNETICS

Length:	2 days
Level:	a Advanced

Background – the industry context and issues relevant to the course
Electromagnetics is the underpinning science that defines all electronic engineering. It is traditionally thought of as difficult and the mathematical approach traditionally taken can be off-putting. For these reasons it is given less attention in many modern undergraduate degree courses. This course is designed to take the mystery out of the subject by presenting it in an applications oriented manner with explanations through word pictures and thought experiments supported by the maths where necessary.

Key subjects covered
- Electric and magnetic fields and their sources
- Faraday's Law and time varying fields
- Electromagnetics and Maxwell's equations
- Electromagnetic waves in free space and other media
- Electromagnetic wave polarisation
- Wave reflection and transmission at boundaries

Course scope
The course comprises a basic introduction to electromagnetics which can inform other studies on topics such as antennas, propagation, EMC and related topics. It also serves as an introduction to studies of electromagnetic numerical modelling.

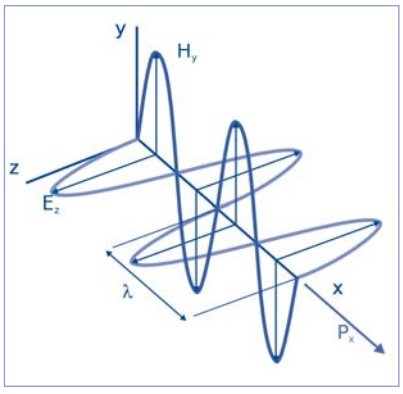
Venue
The University of York

Mode of delivery
This is a lecture based course with demonstrations. Each delegate will receive a set of notes as a reference document.

Who should attend
Engineers needing to have a basic understanding of the electromagnetic phenomena encountered in their workplace.

Presenters
Professor Andy Marvin, Department of Electronics, University of York

Other related courses that may interest you
Principles of Antennas; Introduction to Radio Propagation; Computational Electromagnetics: Frequency Domain Techniques, Computational Electromagnetics: Time Domain Techniques



PRINCIPLES OF TRANSMISSION LINES, CROSSTALK AND CABLE SCREENING

Length:	2 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

Transmission line theory is essential not only in RF and microwave communications but also in the design of fast digital circuits and the understanding of electromagnetic compatibility (EMC) problems. It provides a link between circuit analysis and electromagnetics. Cross-talk is generally the unwanted propagation of noise or interference between transmission lines, but the same effect can be utilised in the design of RF components such as directional couplers.

Key subjects covered

- Transmission line theory: distributed (per-unit-length) parameters, velocity and characteristic impedance
- Reflections and impedance matching
- The Smith Chart
- S-parameters and network analysers
- Cross-talk: coupling mechanisms
- Cross-talk in the frequency domain and time domain
- Cable screening and grounding

Course scope

The course covers both the fundamental theory of transmission lines and its practical applications to propagation, impedance matching, coupling and cross-talk especially in the fields of EMC and RF Communications

Venue

The University of York

Mode of delivery

The course material will be delivered as lectures, which include practical demonstrations, and by hands-on laboratory sessions. Delegates will receive a set of course notes as a reference document.

Who should attend

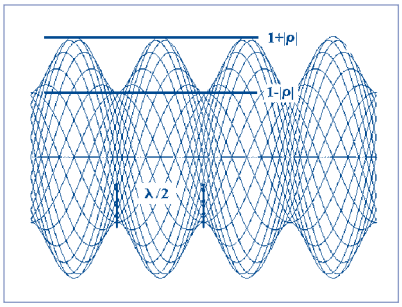
Engineers working in fields such as EMC, digital circuit design and RF and microwave communications, who require an understanding of transmission line theory and its applications to cross-talk, cable screening and related areas.

Presenters

Dr Martin Robinson, Department of Electronics, University of York
Dr David Welsh, York EMC Services Ltd

Other related courses that may interest you

Principles of Engineering Electromagnetics; Advanced Shielding and Filtering; Fundamentals of Design and Testing for EMC



INTRODUCTION TO RADIO PROPAGATION : 2 MODULES

These modules can be booked separately

1: INTRODUCTION TO RADIO PROPAGATION

2: RADIO PROPAGATION FOR MOBILE RADIO

2 modules:	
Length:	Module 1: 2 days Module 2: 1 day
Level:	a Advanced

Background – the industry context and issues relevant to the course

Wireless communications has the potential to provide the dream of the next generation of communications services: access to any information anywhere and at any time. Wireless communications is the fastest and most exciting growth area in communications today, with new standards including WCDMA, cdma-2000, WiFi, WiMAX, Bluetooth, ZigBee and many more appearing regularly, promising to revolutionise our lives with claims of true universal access. Fundamental to all of these technologies is the use of radio; and an understanding of the realistic capabilities of these systems, and an ability to troubleshoot installations, requires a good knowledge of radio propagation effects. This course aims to provide such knowledge.

Key subjects covered

- Propagation in free space
- Basic electromagnetic wave and antenna theory
- Wave propagation mechanisms in the Earth's atmosphere: ground waves, sky-waves and refraction
- Interaction of waves with obstacles of various sizes: diffraction and scattering
- Fading mechanisms, statistics and countermeasures.
- Summary of propagation prediction at various frequency bands ranging from VLF to EHF
- Applications include AM broadcasting design, VHF/UHF television reception and mobile communications, microwave links and satellite communications

Course scope

The course consists of one two-day module introducing the basic concepts of electromagnetic waves and their interaction

with the Earth's atmosphere, terrain and obstructions; and a further optional one-day module examining in more detail on the particular problems of the UHF mobile radio channel used for cellular phones and wireless LANs.

Throughout the course the emphasis is placed on developing a physical understanding of radio propagation, as well as on means to predict coverage areas and transmission ranges. Interference is also considered, as modern systems require ever more reliable radio links.

Venue
University of York

Mode of delivery
Two days – Introduction to Radio Propagation
One day – Radio Propagation for Mobile Radio

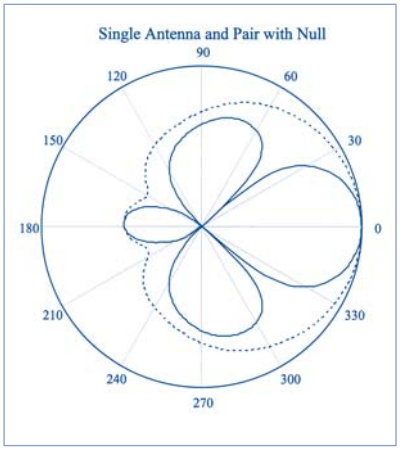
The course is delivered using lectures, with full sets of printed notes and worked examples. Each module can be booked separately.

Who should attend
Electronic engineers interested in the physics of radio-wave propagation. System designers involved in radio communications.

Attendees are expected to hold a recognised engineering qualification (e.g. HND, BEng, MEng or equivalent), as some previous knowledge of electronics and mathematics will be assumed.

Presenters
Dr David Pearce, Department of Electronics, University of York

Other related courses that may interest you
Radio Spectrum Management



RADIO SPECTRUM MANAGEMENT AND THE RADIO REGULATORY ENVIRONMENT

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course
Management of the radio spectrum is increasingly important as pressure grows on this valuable resource. Recent years have seen an explosion of wireless services, bringing challenges of spectral efficiency and interference management. At the same time, there have been worldwide moves towards deregulation. This course deals with both the underlying technical issues and the details of international regulatory considerations to manage the radio spectrum in the 21st century.

Key subjects covered
- Spectrum as a resource, space, time bandwidth: International and national regulation organisations and control methods, assignments, spectrum leasing, spectrum auctioning
- Definitions of spectrum utilisation and utilisation efficiency: Spectrum consuming properties of radio systems and conservation techniques
- Protection ratio, frequency-dependent rejection and the F-D curve
- Relevant propagation mechanisms, antenna standards
- The co-ordination task, spectrum management tools, a priori planning methods, computer based tools, models and databases
- EMC considerations
- The ITU and Radio Regulations: CEPT, ETSI, OFCOM in the UK
- Co-ordination for the fixed satellite service
- Land mobile and broadcast planning. New challenges to utilisation strategies

Course scope
This course approaches the radio spectrum as a finite resource and reviews the requirements, constraints, regulations, tools, techniques and administration necessary to ensure efficient spectrum utilisation. The course will include computer-based case studies in appropriate areas.

Venue
The University of York

Mode of delivery
This is a lecture based course with computer-based case studies.
The course is supported by a set of specifically prepared book quality course notes.

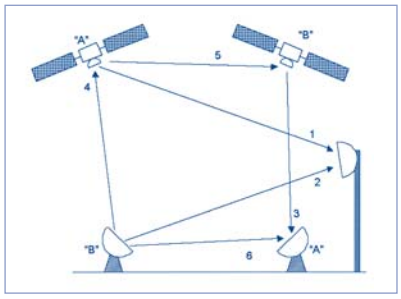
Who should attend
Radio Systems Designers, Radio Spectrum Managers, Radio Systems Consultants and Performance Analysts.

Presenters
Mr Tim Tozer, Department of Electronics, University of York
Prof Leslie Barclay, Barclay Associates Ltd

Prof Alister Burr, Department of Electronics, University of York
Dr R J Cohen, Jodrell Bank, University of Manchester
Dr David Pearce, Department of Electronics, University of York
Mr Mark Posen, RPC Telecommunications
Dr Martin Robinson, Department of Electronics, University of York
Invited specialists from Government Organisations and Industry

Other related courses that may interest you

Small Terminal Satellite Communications: VSAT Systems; Introduction to Radio Propagation; Communications in Railways



RF & MICROWAVE CIRCUIT DESIGN

Theory with practical hardware design exercise

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

Many devices rely on wireless interconnectivity. This course forms a five day advanced course that covers RF and microwave hardware design, at the theory, circuit, modelling, layout and enclosure levels, to produce working hardware designs. The course includes both theoretical and circuit aspects, as well as the practical considerations of real components and circuit layout.

Key subjects covered

- RF and microwave receiver and transmitter systems
- Review the fundamentals of RF circuit theory
- Review of basic microwave circuit theory, including transmission lines and distributed circuits, 2 port parameters and s-parameters, Smith charts and matching networks
- Description of the detailed design principles used in RF receiver and transmitter design. These include, low noise small signal amplifiers; power amplifiers; mixers; milters; low phase noise oscillators; matching networks
- The design process, active and passive device models, optimisation, construction techniques and PCB design and EMC considerations
- Practical design and measurement techniques are included in the extensive laboratory classes. Highlights include the design, construction and measurement of a low noise amplifier, a filter and a low phase noise oscillator. Frequency response measurements are performed on the amplifier, filter and oscillator resonator. Noise figure measurements are performed on the amplifier. Open loop characterisation and closed loop phase noise measurements are performed on the oscillators. The results are compared with theory
- Modern CAD techniques (using HP/EESOF Series IV software) will be introduced

Course scope

The course will describe the theory, device models and design techniques required to develop most of the major building blocks in modern RF and microwave transmitters and receivers. Subject areas include: passive and active component models, impedance matching, small signal amplifier design, mixers, low noise oscillator design, filter design, PCB design, EMC aspects, enclosures and shielding, modulation and power amplifier design. The course also provides an opportunity, through laboratory classes, to apply this theory to the design and construction of low noise amplifiers, low phase noise oscillators and filters using either lumped or distributed circuit techniques.

Venue

The University of York

Mode of delivery

The approach taken is to combine theory, design exercises, CAD and practical laboratory sessions to provide an enhanced learning experience.
The course is supported by a set of specifically prepared book quality course notes.

Who should attend

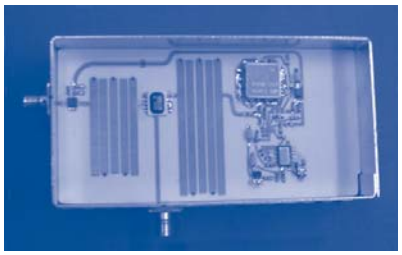
Graduate engineers who are new to the field of RF and microwave engineering or engineers who require a broadening of their design skills. The course encompasses both lumped element and distributed transmission line design techniques. The course assumes a basic knowledge of analogue circuit design.

Presenters

Dr Myles Capstick, Department of Electronics, University of York
Prof Alister Burr, Department of Electronics, University of York
Prof Jeremy Everard, Department of Electronics, University of York

Other related courses that may interest you

Design for EMC; Advanced Shielding and Filtering, Radio Spectrum Management



Tel: +44(0)1904 434440 · cpd@yorkemc.co.uk

SMALL TERMINAL SATELLITE COMMUNICATIONS: VSATS

Length:	5 days
Level:	a Advanced

Background – the industry context and issues relevant to the course

Communications systems using Very Small Aperture Terminals (VSATs) are well established world-wide. Such networks support a wide range of communications requirements and can provide highly effective broadband, Internet and multimedia services. With benefits of low cost, wide coverage, and flexible and rapid deployment, VSATs serve a variety of users including corporate, SOHO, and domestic users. The VSATs market remains very strong, with growth especially in developing countries. This is coupled with steady advances in technology and techniques for Internet service delivery to bridge the 'digital divide'.

Key subjects covered

The course aims to provide state-of-the-art exposition of practical VSAT technology and systems, together with a grounding in the fundamentals of satellite communications. You will learn:

- What VSATs are, and their applications areas
- The technical background of satellite communications
- To perform Link Budget analyses and understand system impairments
- Features of VSAT data networks and service provision
- Principles of data protocols and network management in VSAT systems
- Implications and practice of multimedia and Internet service delivery
- Planning and sizing of VSAT networks
- Technology issues for VSAT systems
- Appreciation of regulatory constraints, the market, and business opportunities
- The status of current VSAT programmes

Course scope

This course gives a technical foundation for all those involved with VSATs, coupled with a full appreciation of the latest developments, and provides the understanding to deal with VSAT communications and services. It commences with fundamental technical principles ranging from system architectures to terminal elements. Topics are developed through link engineering parameters into detailed access schemes and protocols. These are then illustrated through case studies and presentations on state-of-the-art commercial systems.

This is a professional engineering course including mathematical aspects where appropriate, and a basic knowledge of telecommunications principles will be assumed.

Venue

The University of York

Mode of delivery

The course comprises lectures and presentations given by academics and leading practitioners in VSAT systems and services, supported by a comprehensive set of course notes. There are also some simple tutorial exercises. Numbers are limited, allowing for easy interaction between presenters and students.

Who should attend

All those requiring a technical understanding of VSAT systems as well as detailed knowledge of current systems practice. The course will serve engineers and information technologists as well as managers, users and those concerned about the impact of VSATs. Some basic knowledge of telecommunications principles will be assumed.

Presenters

Mr Tim Tozer, Department of Electronics, University of York.

Other Presenters include recognised experts in the field, from leading organisations and companies, service providers and academia within Europe and the USA. This provides exposition of the latest thinking and practice in VSAT systems and services.

Other related courses that may interest you

Introduction to Radio Propagation; Communications in Railways; Radio Spectrum Management

This course is supported by the IEE Professional Network on Satellite Systems & Applications.

The Department of Electronics is a member of the Global VSAT Forum.

INTRODUCTION TO NANOTECHNOLOGY

Length:	1 day
Level:	b Briefing

Background – the industry context and issues relevant to the course

Nanotechnology is the design and manufacture of materials and devices with dimensions measured in nanometres and usually less than 100 nanometres. One nanometre is 10^{-9} metre, or a millionth of a millimetre. By controlling the structure and composition of devices and materials at nanometre/atomic scale, the performance of the products can be greatly improved and new functionality be developed. The progress in Nanotechnology has been leading to the development of super-high-density data storage and super-high-speed microprocessors, memory chips and novel nanodevices. Apart from micro/nanoelectronics, Nanotechnology is also finding a wide range of applications in many other areas such as medical industry, clean chemistry and the aerospace industry. During this course, we will introduce how to fabricate and characterise these nanodevices and their applications in future industries and impact on society.

Key subjects covered

- Nanofabrication and Nano analysis
- Nanoelectronics and advanced data storage
- Bio-nanotechnology
- Impact to future industry and society

Course scope

This is a one day introduction course to Nanotechnology. We will first introduce two approaches to fabricate nano scale devices and materials: bottom up nanofabrication and top down nanofabrication. The bottom up nanofabrication is to build up nanometre scale devices atom-by-atom via either self-assembly, or atomic manipulation using scanning probing microscopy. Top down nanofabrication produces nanometre scale devices from bulk materials by lithography techniques, which include photolithography, e-beam lithography, focused ion beam lithography and nanoimprint etc. Several analysis techniques will be introduced including for example scanning tunneling microscopy, scanning electron miscopy and x-ray photoemission. We will introduce the latest developments in micro/nanoelectronics, data storage and bio-nanotechnology. The challenges, risk and opportunities to society and industry will be discussed.

Venue

The University of York and various locations in the UK as advertised.

Mode of delivery

Lecture/seminar

Who should attend

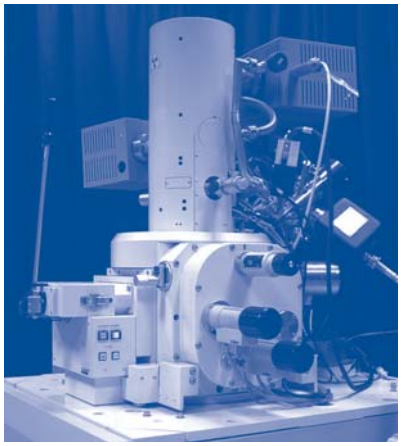
Managers of high tech industries, research centres and financial market

Presenters (Provisional)

Dr Yongbing Xu, Department of Electronics, University of York
Dr Christoph Baumann, Department of Biology, University of York
Mr Tony Ward, Department of Electronics, University of York

Other related courses that may interest you

Nanotechnology and Nanodevices



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NANOTECHNOLOGY AND NANODEVICES

Length:	3 days
Level:	i Introductory course

Background – the industry context and issues relevant to the course

Nanotechnology is the design and manufacture of materials and devices with dimensions measured in nanometres and usually less than 100 nanometres. One nanometre is 10^{-9} metre, or a millionth of a millimetre. By controlling the structure and composition of device and materials at nanometre/atomic scale, the performance of the products will be greatly improved and new functionality be developed. The progress in Nanotechnology has been leading to the development of super-high-density data storage and super-high-speed microprocessors, memory chips and novel nanodevices. Apart from micro/nanoelectronics, Nanotechnology is also finding a wide range of applications in many other areas such as medical industry, clean chemistry and the aerospace industry. During this course, experts from Electronics, Physics, Biology and Chemistry will explain and demonstrate how to fabricate and characterise these nanodevices and their applications in future industries.

Key subjects covered

- Introduction to Nanotechnology
- Nanofabrication
- Nano-analysis
- Nanoelectronics and advanced data storage
- Photonics and Nano-photonics
- Quantum computing
- Bio-nanotechnology
- Nanotechnology and clean chemistry
- Impact to future industry and society

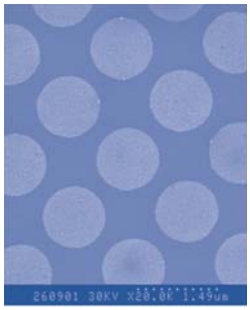
Course scope
This is a three day course in Nanotechnology. We will first introduce the concept of nanotechnology and the basic science behind it. We will then describe/explain two approaches to fabricate nano scale devices and materials will be explained: bottom up nanofabrication and top down nanofabrication. The bottom up nanofabrication is to build up nanometre scale devices atom-by-atom via either self-assembly, or atomic manipulation using scanning probing microscopy. Top down nanofabrication produces nanometre scale devices from bulk materials by lithography techniques, which include photolithography, e-beam lithography, focused ion beam lithography and nanoimprint etc. Several analysis techniques will be discussed including for example scanning tunneling microscopy, scanning electron miscopy and x-ray photoemission. We will explain how nanotechnology is used in micro/nanoelectronics, data storage, phonics, future computing, clean chemistry and bio-nanotechnology and introduce the latest developments in these areas. Finally, the challenges, risk and opportunities to future society and industry will be discussed. This course will also include demonstrations in the York NanoCenter, Clean room and Molecular beam epitaxy growth laboratory.

Venue
The University of York

Mode of delivery
Lecture and Lab demonstration
Delegates will receive a set of course notes as a reference document.

Who should attend
Engineers in industry, research institutes and academia who want to acquaint themselves with this exciting new technology.

Presenters (Provisional)
Dr Yongbing Xu, Department of Electronics, University of York
Dr Eugene Avrutin, Department of Electronics, University of York
Dr Christoph Baumann, Department of Biology, University of York
Dr Julian Miller, Department of Electronics, University of York
Dr Steve Tear, Department of Physics, University of York
Mr Tony Ward, Department of Electronics, University of York
Dr Karen Wilson, Department of Chemistry, University of York



COMMUNICATIONS IN RAILWAYS

Length:	2 days
Level:	Introductory course

Background – the industry context and issues relevant to the course
The advent of GSM(R) and ERTMS heralds significant issues for the integration of these radio based systems into the railway infrastructure and rolling stock. Other new technologies are also impacting the railway industry, third generation mobile communications, TETRA and WiFi systems accessing the internet via train-borne VSAT systems. It is therefore essential for railway engineers to understand how these systems operate and the likely impact they will have on existing infrastructure and rolling stock. Also the exposure to electromagnetic fields of both the general public and railway employees is of concern.

Key subjects covered
- Principles of GSM(R)
- Principles of TETRA and its effects
- What is WiFi, how is it being used in the railway environment and what is the impact?
- VSAT case study, including EMC assurance
- EMFs - the legal requirements (the Physical Agents Directive), the threats from new technologies

Course scope
The aim of this course is to provide delegates with an understanding of new communications technologies that are being introduced into the railway environment and their likely impact in terms of system integration. The course will also consider the introduction of new technologies external to the railway such as UTMS and their likely impact on the railway, for example passengers carrying headsets onto trains and using them within the railway environment and the positioning of base stations adjacent to the railway infrastructure. The threats to health from EMFs resulting from these technologies will be reviewed and their impact in the light of recent and impending legislation.

Venue
The University of York or York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK

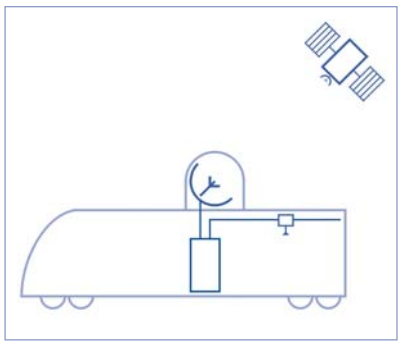
Mode of delivery
Illustrated lectures with interactive discussion. Each delegate will receive a set of course notes as a reference document.

Who should attend
Railway professionals involved in: system integration, telecommunications, train control/signalling, project management, TOC and ROSCO engineers introducing new technology into rolling stock, EMC Engineers and Assurance managers

Presenters
Dr David Pearce, Department of Electronics, University of York
Dr Mark Tyndall, York EMC Services Ltd

Other related courses that may interest you

EMC in Railways; Railway Electrification; Small Terminal Satellite Communications: VSAT Systems; Radio Spectrum Management; Electromagnetic Fields (EMF Awareness)



ELECTROMAGNETIC COMPATIBILITY (EMC) IN RAILWAYS

Length:	3 days
Level:	Introductory course

Background – the industry context and issues relevant to the course

The control of Electromagnetic Interference (EMI) in the Railway environment is a major problem for both the infrastructure controller and train operators. The dynamic nature of the railway, the use of modern power electronics/inverter technology for traction drives and the use of modern radio based technology presents a harsh and complex electromagnetic environment in which safety critical equipment must operate as intended.

Key subjects covered

- Definition of EMC
- The management of EMC to satisfy both safety and conformance requirements – EMC management/control plans, sub-system requirements and procurement
- The legal conformance requirements – the EMC Directives 89/336/EEC and 2004/108/EC and the implementing legislation
- Relevant EMC Standards: product and generic standards, the EN50121-X series of standards, etc
- The requirements of the Technical Construction File (TCF) and EMC technical documentation
- The EMC aspects of the Safety Case – the requirements and application of GM/RT8015 'group standard'
- Feeding arrangements ac and dc railways
- Threats from ac and dc traction drives
- Transmission lines and crosstalk
- Screening and enclosures
- Touch potentials and earthing strategies
- Immunisation case studies
- Railway EMC measurements

Course scope

This course will provide an introduction to EMC in the railway environment. It will provide an understanding of its importance and the need to manage EMC from project concept to completion. The legal EMC requirements will be explained and how these are satisfied by use of standards and the TCF/technical documentation; these requirements will be related to safety case requirements and in particular group standard GM/RT8015. In order to understand the railway EM environment it is necessary to appreciate the power feeding arrangements in ac and dc railways; the EMI threats posed by traction drives; how unwanted signals couple into lineside S & T cables; how to shield/screen equipment; the effects of earthing strategies on 'touch' potentials; practical immunisation case studies; and railway EMC measurements trackside and laboratory.

Venue

The University of York

Mode of delivery

Lectures and demonstrations. Each delegate will receive a set of notes as a reference document.

Who should attend

The course will be of interest to professional engineers concerned with: project management, system integration, equipment design, approvals and assurance, from all areas of the railway industry: Network operators; TOCs; ROSCOs; Consultancies; Rolling Stock Manufacturers; signalling and infrastructure equipment designers and manufacturers.

Presenters

Mr Chris Marshman, York EMC Services Ltd
Mr Andy Rowell, York EMC Services Ltd
Dr David Welsh, York EMC Services Ltd

Other related courses that may interest you

EMC Testing Workshop practical day; Railway Electrification; Communications in Railways

Tel: +44(0)1904 434440 · cpd@yorkemc.co.uk

RAILWAY ELECTRIFICATION

Length:	2 days
Level:	Introductory course

Background – the industry context and issues relevant to the course

Railway electrification systems have undergone significant development in recent years due to the demands of high-speed lines, metros and light rail systems. In order to achieve safe and reliable integration of electrical/electronic systems, such as train control systems, in the railway environment, a basic understanding of railway electrification systems is required. This is an essential pre-requisite for understanding EMC issues for example. Also railway electrification is changing with moves away from traditional dc and162/3 Hz systems in Europe to 25kVac and in the UK the introduction of auto-transformers on the WCRM project.

Key subjects covered

- dc Railway electrification
- ac Railway electrification 'booster' transformer and 'auto-transformer' systems
- Protection systems for ac and dc railways
- Earthing strategies and 'touch' potentials
- Earthing and grounding
- System modelling dc
- System modelling ac
- Current collection equipment – OLE, 3rd/4th rail systems

Course scope

The course covers dc railway electrification systems, including sub-station spacing, supply voltage system regulation, rectifiers, substation rating, fault currents; ac railway electrification, including explanations of booster transformer and auto-transformer systems; protection systems, including vacuum breakers, high speed-breakers, distance impedance protection, track fault discrimination, earth fault detection; earthing strategies, stray current corrosion, diode earth systems, floating systems, effects on touch potentials; examples of dc and ac system models; overhead contact line arrangement, conductors, pantograph design, dynamic characteristics, conductor rails, shoe-gear, arcing/wear and maintenance.

Venue

The University of York

Mode of delivery

Lectures and demonstrations. Each delegate will receive a set of notes as a reference document.

Who should attend

Those requiring an introduction to railway electrification. Graduate engineers new to the rail industry, engineers needing to understand booster Vs auto transformer systems, essential background for systems integrators and EMC Assurance Managers/Engineers

Presenters

Mr Chris Marshman, York EMC Services Ltd
Prof György Varju, Budapest University of Technology and Economics
Dr David Welsh, York EMC Services Ltd
Dr Roger White, Atkins Rail

Other related courses that may interest you

EMC in Railways; Communications in Railways; EMC Regulations, Standards and Management

Member
Railway Industry Association

Link-up
18334

EUROPEAN EMC AUTOMOTIVE REGULATIONS

Complying with the New Automotive EMC Directive (2004/104/EC)

Length:	1 day
Level:	Introductory course

Background – the industry context and issues relevant to the course

Almost all electrical and electronic devices fitted to most road-going vehicles have to comply with the Automotive EMC Directive (currently 95/54/EC). In 2006, a new Automotive EMC Directive (2004/104/EC) will enter into force, which will change the type approval process - particularly in the case of aftermarket equipment.

Key subjects covered

- The Automotive EMC environment and the way it differs from the commercial/industrial EMC environments
- History behind the current and new Automotive EMC Directives
- Type approval and marking requirements of the Automotive EMC Directive
- Technical requirements for radiated emissions, radiated immunity and transient emissions/immunity for the Directive
- The test standards - CISPR 12, CISPR 25, ISO 11451, ISO 11452 and ISO 7637

Course scope

The course will explain the full details, both technical and legal, relating to the new Automotive EMC Directive so that participants will have a full understanding of how it affects them. It will also explain the technical limitations of the Directive and why manufacturers may need to exceed its requirements.

Venue

The University of York

Mode of delivery
Lectures with Powerpoint presentation

Who should attend
EMC test and design engineers
Engineers working for automotive vehicle and component manufacturers
Engineers and sales/marketing directors working for aftermarket manufacturers

Presenters
Dr Ian Noble, Engineering Consultant to the Automotive Industry

Other related courses that may interest you
EMC Regulations, Standards and Management; EMC Design; Advanced EMC Design; Design Filtering and Shielding for EMC 1 and 2; EMC Testing Workshop; Validation, Verification and Measurement Workshop

EMF AWARENESS

Length:	1 day
Level:	b Briefing

Background – the industry context and issues relevant to the course
The EMF Directive 2004/40/EC will be transposed into UK law by April 2008, and will place obligations on employers to protect their employees from dangerously high levels of electromagnetic fields. This seminar introduces the Directive, the reasons for its introduction and employers' upcoming obligations.

Key subjects covered
- EMFs and Health Effects:
  - Structure of seminar
  - What are EMFs?
  - What are their health effects?
- Guidelines in depth:
  - Basic restrictions / exposure limit values
  - Reference levels / action values
- European Legislation:
  - EMF Recommendation
  - EMF Directive:
    - Emphasis on reducing emissions
    - Employer obligations
    - Assessments
    - Problems
- UK Legislation & Standards:
  - Assessments
  - Measurements
  - Calculations

Course scope
Introducing EMFs and the EMF Directive & recommendation; ICNIRP guidelines; employers' obligations

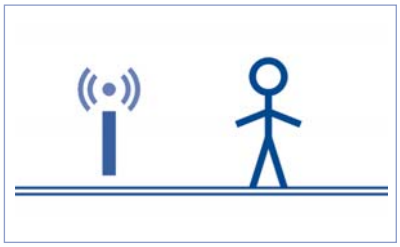
Venue
York EMC Services Ltd UKAS accredited Test Laboratory at Castleford, Yorkshire, UK

Mode of delivery
One day, mid morning – mid afternoon

Who should attend
Managers and those tasked with assuring workplace health & safety.

Presenters
Dr Mark Tyndall, York EMC Services Ltd

Other related courses that may interest you
Acoustics in Buildings



EMF AND INTERFERENCE HAZARDS IN THE HEALTHCARE ENVIRONMENT

These modules can be booked separately

Length:	Module 1: 2 days Module 2: 2 days Module 3: 1 day
Level:	i Introductory course

Background – the industry context and issues relevant to the course
Electromagnetic Fields and Interference Issues affect the Healthcare/Medical Devices Industry:
- On the 24th April 2004, a new Directive (2004/40/EC) was published in the Official Journal of the European Union to limit exposure to physical agents (Electromagnetic Fields, EMF) to all employees. The 'EMF Directive' will be soon transposed into UK law, and the whole healthcare industry will have to perform an assessment of the EMF exposure to all staff, as it will be a legal requirement.
- Since the implementation of the Medical Devices Directive (MDD) in 1998, electro-medical equipment is required to comply with the electrical safety requirements (BS EN 60601-1-1:2001) and the electromagnetic compatibility (EMC) requirements (BS EN60601-1-2:2002) to be allowed to carry the CE marking.
- Within the hospital environment, professionals involved must become competent managers of EMC and electrical safety.

Key subjects covered

This unique course has been designed to provide you with an introduction to EMF, EMC, electrical safety issues for electro-medical equipment, and risk management techniques.

- Electromagnetic Fields (EMF) & Physical Agents Directive
- Electromagnetic Compatibility (EMC)
- Electromagnetic Risk Management for Medical Devices and Hospital Equipment
- Electrical Safety for Medical Devices

Course scope

This is an introductory-level course comprising learning modules that combine to provide you with the essential knowledge required to help you minimise the risks and promote an electrically safe and interference-free hospital environment.

Mode of delivery

The course is delivered as two, two-day learning modules and a one-day workshop that run at approximately a two-week interval. Each module can be booked separately and is supported by a full set of book-quality course notes.

Who should attend

Electro-medical equipment designers
Medical physicists
Technicians working in hospitals
Managers responsible for Clinical Governance and patient safety
Healthcare facilities construction engineers

Attendees are expected to hold a recognised engineering qualification: HND, BEng, MEng or equivalent

Presenters

Dr Martin Robinson, Prof Andy Marvin, Dr John Dawson, Department of Electronics, The University of York
Dr Steve Smye, Head of Department of Medical Physics & Engineering, St James's Hospital, Leeds and former President of IPEM
Mr Ian Cutler, ABHI, Regulatory Affairs Consultant to the Medical Devices Industry
Dr Didier Bozec, York EMC Services Ltd
Mr Chris Marshman, York EMC Services Ltd
Mr Nick Wainwright, York EMC Services Ltd
Dr David Welsh, York EMC Services Ltd
Mr Ian Gillham (formerly), York EMC Services Ltd

MODULE 1 – REGULATIONS, STANDARDS AND RISK MANAGEMENT

Venue

The University of York with the Department of Health Sciences Clinical Simulation Unit

Key subjects covered

- The Hospital EM Environment
- EMF - The Physical Agents Directive
- Definition and Demonstration of EMC with Propagation and Coupling Mechanisms
- The EMC Directive
- The New EMC Directive
- The EU Medical Devices Directive
- EMF & EMC Management
- Wireless Communications in the Hospital Environment
- EMF & EMC issues in Building Construction, with Case-study
- Practical Session: On-site Risk Evaluation and Risk Management in the Hospital Ward
- An overview of EMC Testing required by EN60601-1-2

MODULE 2 – DESIGN FOR EMC AND ELECTRICAL SAFETY

Venue

The University of York

Key subjects covered

- Overview of EMC Design Principles
- Conducted Interference
- EMC on a PCB
- Transmission Lines, Crosstalk and Cable Coupling
- Screening and Enclosures
- Electrical Safety for Medical Devices EN60601-1-1
- Principles of Electrical safety
- Electrical safety: Creepage & Clearance, Tests & Measurement
- Electrical Safety: Case Studies and Practical Demonstrations

MODULE 3 – EMC TESTING WORKSHOP

Venue

York EMC Services Ltd UKAS accredited EMC Castleford Test Centre.

An all-day practical EMC Testing Workshop that will cover practical laboratory testing of equipment for electromagnetic emissions and susceptibility to interference. (see page 7 for details)

ACOUSTICS IN BUILDINGS: MODULE 1

This module can be booked separately

Length:	2 days
Level:	Introductory course

Background – the industry context and issues relevant to the course

Acoustics is a well-established science and the underlying principles behind acoustic transmission and acoustic behaviour in free space and enclosures is well understood. This course will enable those working in acoustics to have a better understanding of the underlying science.

Key subjects covered

- Introduction to Acoustics
- Transmission in free space
- Directivity
- Acoustics of enclosed spaces
- Measuring instruments: microphones, loudspeakers, analysers

Course scope

This course aims to provide a theoretical and practical introduction to acoustics. It serves as an introduction to the material covered on the companion course "Acoustics in buildings - module 2".

Venue

The University of York

Mode of delivery

Lectures, laboratory sessions, demonstrations.
Delegates will receive a set of course notes as a reference document.

Who should attend

All interested in understanding the basic principles of acoustic science.

Presenters

Professor David M Howard, Department of Electronics, University of York
Dr Damian Murphy, Department of Electronics, University of York
Dr Jez Wells (provisional) Department of Electronics, University of York

Other related courses that may interest you

Acoustics in Buildings 2

ACOUSTICS IN BUILDINGS: MODULE 2

This module can be booked separately

Length:	2 days
Level:	Introductory course

Background – the industry context and issues relevant to the course

Acoustics is a well-established science and the acoustics of spaces can now be modelled and measured. Legislation now exists which governs the acoustic properties of certain spaces. This course will enable those working in these areas to have a better understanding of the underlying science.

Key subjects covered

- Reverberation time definition and calculation
- Computational acoustic modelling demonstration
- Practical acoustic measurement workshop
- The modal region
- Room acoustic design
- European acoustics standards

Course scope

This course aims to provide a theoretical and practical introduction to the acoustics of rooms, as well as how measurements can be made. European acoustic standards will be introduced and discussed. The companion course "Acoustics in buildings - module 1" is the normal introductory route to this course.

Venue

University of York

Mode of delivery

Lectures, laboratory sessions and demonstrations.
Delegates will receive a set of course notes as a reference document.

Who should attend

Anyone interested in the acoustics of spaces

Presenters

Professor David M Howard, Department of Electronics, University of York
Dr Damian Murphy, Department of Electronics, University of York
Dr Mark Tyndall, York EMC Services Ltd
Dr Jez Wells (provisional), Department of Electronics, University of York

Other related courses that may interest you

Acoustics in Buildings 1

ADDITIONAL COURSES FOR IN-HOUSE COMPANY DELIVERY

The following courses and workshops are not advertised as open courses but can be customised to individual company needs and delivered at a mutually convenient location.

BEGINNER'S GUIDE TO EMC

Length:	1 day
Level:	b Briefing

Key subjects covered
- What is EMC?
- The European EMC Directive
- Routes to Compliance and Declaration of Conformity
- Legislation – enforcement, offences, penalties – defence of 'due diligence'
- Testing for EMC – including tour of facilities
- Design for EMC – 10 lessons from experience
- On-going compliance
- Project and Company EMC Strategies

Course scope
To provide familiarization with the European EMC regulations
To enable a Company EMC strategy to be formulated
To provide an overview of EMC testing requirements
To provide an overview of EMC design rules

Who should attend
For Electronics Engineers or Technical Engineers directly involved in electronics design. Technical and QA Managers new to Electromagnetic Compatibility.

ELECTRICAL SAFETY REQUIREMENTS

Length:	2 days
Level:	W Interactive workshop

Key subjects covered
- The legal background to CE Marking, Product Safety and Product Liability
- The role of harmonized standards
- Selecting the appropriate standard
- Routes to CE Marking
- Technical Files
- Assessment of Product Safety
- Classification of hazards
- Creepage, clearance and distance through insulation
- Interpreting standards
- Case studies and practical examples
- Product descriptions and manufacturing surveillance
- Checklists
- Testing

Course scope
To provide familiarization with the European 'Low Voltage' Directive
To provide familiarization with the electrical safety requirements of the European 'Machinery' Directive
The key features of safety standards eg. EN 60950 and their relevance to designers and approvals engineers
The scope of testing required
To provide a practical review of hardware to illustrate good and bad safety practices

Who should attend
For Electrical Engineers or Technicians directly involved in design, Quality Assurance Engineers and engineers involved in product certification

EMC FOR SYSTEMS INTEGRATORS & CONTROL PANELS

Length:	1 day
Level:	W Interactive workshop

Background – the industry context and issues relevant to the course
Systems integrators probably have one of the greatest challenges in meeting the European EMC Directive. Manufacturers of systems be they "panel builders" or "rack & stack integrators" usually have: Short lead times; Low margins; One off or low volumes; Highly competitive market.
To help address these challenges, YES Ltd now offers a special one day course.

Key subjects covered
- What is EMC?
- The UK Legislation in brief
- EMC theory and practices without maths
- Case Study Template
- Application of Template
- Your cost effective route to compliance

Who should attend
For Electrical Engineers or Technicians directly involved in design, QA Engineers and engineers involved in product certification.

ON-GOING COMPLIANCE FOR PRODUCTION

Length:	1 day
Level:	W Interactive workshop

Background – the industry context and issues relevant to the course
After all the hard work that you put into ensuring that your products complied with the EMC directive, how confident are you that the same product made two years later will still comply?

Key subjects covered

- What is "on-going compliance"?
- Legal requirements
- The 80/80 rule
- Quality Assurance including handling changes & variants
- Sampling plans
- In-house testing
- Case studies

Course scope

On this 1 day course you will learn the importance of ensuring "On-going compliance" and how you can attain a reasonable confidence of achieving it.

Who should attend

For Engineering Managers, Quality Managers, Approvals Engineers and Design Engineers.

RF/EMC TRAINING PROGRAMME FOR RADIO FREQUENCY ENGINEERS INTRODUCTORY COURSE

Length:	2 days
Level:	(i) Introductory course

Background

RF engineering can be a 'black art'! This course has been developed to dispel this myth. It is aimed at electrical/electronics engineers, mechanical engineers, draughtspersons, RF component sales engineers, etc. – to give them both understanding and rules, so that they can avoid making fundamental design errors that are costly to rectify.

Key subjects covered

Day 1

- Introduction
- Electrical Basics
- Transmission Line Basics
- Introduction to Electromagnetic compatibility (EMC)
- Fundamentals
- Overview of EMC design rules (practical overview)
- Conducted and Radiated Interference

Day 2

- Crosstalk and cable coupling
- Overview of EMC considerations in dc power supplies
- RF/EMC considerations for printed circuit board design
- PCB EMC Design Rules
- RF Design Rules
- Introduction to Shielding and enclosures
- Impact of materials/finishes on RF performance
- EMC gaskets - types/properties and design requirements
- Thermal Design

Mode of delivery:

Lectures with powerpoint presentations and demonstrations

WIREMAN'S WORKSHOP

Length:	1 day
Level:	(W) Interactive workshop

Key subjects covered

- What is EMC?
- Civil Requirements
- Cables - types of cables; routing of cables for EMC; terminating cables for EMC
- Grounding - what is grounding? Grounding methods
- Filtering
- Guidance Documents (NES515, NES1027 & BS IEC1000-5-2)

Who should attend

For wiring technicians and their supervisors.

INTRODUCTION TO HUMAN SPEECH PRODUCTION AND PERCEPTION FOR ENGINEERS

Length:	5 days
Level:	(a) Advanced

Course scope

This course provides a broad introduction to the processes involved in spoken human communication, aiming to provide engineers working on speech with an understanding of the acoustics of speech and hearing, phonetics and linguistics and how these can inform work in speech analysis, coding, synthesis and recognition. Phonetic, linguistic and acoustic aspects are covered in order that the function and physical nature of the various constituent parts of spoken messages can be understood. This provides a basis for a detailed description of the speech pressure waveform to be given, along with an overview of the acoustic analysis carried out by the peripheral hearing system. Laboratory sessions are included during which acoustic aspects of speech are explored.

It will be helpful to anyone working with speech, whether this is speech transmission, speech analysis, speech synthesis or speech recognition, who is interested in understanding the nature of the speech pressure waveform with respect to the sounds of English, and how we use these sounds to communicate with one another.

Key subjects covered

- Phonetics: An introduction to phonetic description and phonological analysis by considering practical and theoretical issues to develop skills in production, distinction and basic notation of articulatory and auditory categories appropriate for the description of speech
- Phonology: An introduction to phonological contrast, structure and representation with special attention to stress, intonation to provide a grounding in the basic analytic tools necessary for phonological analysis
- Syntax: The concepts of 'category' and 'constituent structure' and their role in making syntactic analyses of

language data are discussed as well as the relationship between syntax and semantics to provide an introduction to the fundamentals of syntactic description
- Acoustics of speech production: The source/filter model of speech production and the acoustics of speech in terms of phonetic descriptors are described to provide an understanding of the nature of the speech pressure waveform
- Human peripheral hearing system: The anatomy of the human peripheral hearing system will be explored as well as its frequency response and how the inner ear carries out an analysis of sounds to provide a basis for understanding which elements of the speech pressure signal are important for perceiving the message
- Speech analysis and synthesis: Standard algorithms for speech analysis and synthesis will be explored with special reference to how knowledge of the acoustics of speech production and perception can inform the design of speech systems.

SPEECH CODING TECHNIQUES

Length:	5 days
Level:	a Advanced

Course scope

This course will explore speech acoustics and speech coding methods to enable an understanding of the principles that underpin their operation, their bandwidth requirements as well as their limitations in terms of delivery of natural sounding speech. In addition, issues in regard to the testing of speech coders will be explored. It will be helpful to engineers requiring an understanding of the principles that underpin their operation, their bandwidth requirements as well as their limitations in terms of delivery of natural sounding speech.

The mode of teaching will be by formal lecture presentations and supporting laboratory and workshop work. In addition, there will be an introductory lecture and an industrial lecture.

Key subjects covered

- Introduction to phonetics
- Introduction to speech acoustics
- Introduction to source coding
- Introduction to sink coding
- Introduction to LPC methods
- The mathematics behind LPC
- LPC residual coding
- Sub-band coding
- Other audio coding schemes
- Coder testing in practice

BOOKING A COURSE

Booking forms can be downloaded from the website www.yorkemc.co.uk. Alternatively you can request one from the CPD Secretary (Tel 01904 434440).
Please complete and return the Booking form (or a photocopy) and send it, together with an official order, or credit card details to the CPD Co-ordinator at the address shown below.
Advance telephone reservations are advised.
Your booking will be acknowledged by email.
We advise that the final date for accepting bookings is 10 working days prior to the commencement of the course, late bookings are accepted at the discretion of the course organiser.

Payment

You will be invoiced by York EMC Services Ltd and these courses are subject to VAT.
Payment is required prior to attendance.

Joining Instructions

Joining instructions will be sent by email two weeks prior to the course commencement.

Accommodation and meals

Lunch and refreshments are included in the course fee.
Courses are non-residential but we are happy to supply details of some of York's many hotels and guesthouses, including some that provide negotiated special rates for our attendees.

Parking

Course attendees will be given parking permits on request for the appropriate university car parks.

Cancellation

If a booking is cancelled within a period up until 2 weeks prior to the commencement of the course, 15% of the course fees are payable. If the cancellation takes place within 2 weeks prior to the course commencing, full fees are payable.

CPD Contact Details
Judy Parker, CPD Co-ordinator
Karen Rippon, CPD Secretary

York EMC Services Ltd, University of York, Heslington, YORK, YO10 5DD
Tel. +44 (0) 1904 434440
Fax +44 (0) 1904 434434
e-mail: cpd@yorkemc.co.uk

BESPOKE COURSES

Please contact us to discuss your bespoke or in-house course requirements. Courses can be tailored to your specifications, based on courses advertised in this brochure, or the components of different courses, and other research expertise we have at York.

DIRECTIONS TO TEACHING VENUES

The short courses usually take place in Room PT310 in the Physics/Electronics Building at the University of York.

The workshops take place at York EMC Services Ltd UKAS Accredited Test Centre at Castleford. Directions can be found at the following website
http://www.yorkemc.co.uk/info/maps/castleford.html.
Full information is given in your joining instructions.

TRAVELLING TO YORK

The University campus is about 1 mile from the centre of the city of York, which offers much of historical and tourist interest. York has good transport links via the motorways M1 and A1, and an excellent rail service from other parts of the UK. York is approximately 2 hours from London Kings Cross Station, and 1hr 50 minutes from Manchester Airport.

The following websites will help with your travel arrangements:
http://www.york.gov.uk/visiting/travel/index.html
http://www.nationalrail.com/

Getting to The University of York

Detailed information can be found at:
http://www.york.ac.uk/np/maps/local.htm - Heslington Campus
http://www.york.ac.uk/np/maps/town.htm - King's Manor
http://www.firstgroup.com/ukbus/yorkhumber/york/home/index.php - Local bus services

The University Campus

http://www.york.ac.uk/np/maps/hes.htm shows the buildings on the campus and
http://www.york.ac.uk/np/maps/carbike.htm shows car parks and cycle tracks.

Maps of York

City centre location maps for reference to Kings Manor and the hotels listed, and details of taxi ranks, parking etc can be found at http://www.thisisyork.co.uk/ scroll down to 'travel & transport', select 'maps'
or visit the site: http://www.york.gov.uk/visiting/
Details of Drive times to York, Coming by train, Airports, and Taxis in York can also be found at these sites.

Weather

http://www.metoffice.gov.uk/weather/europe/uk

THE UNIVERSITY OF YORK

The University of York was founded in 1963 with 200 students. Since then, it has expanded to 10,000 students and has over 30 academic departments and research centres. From its inception, the University has concentrated on strong viable departments and teaching and research of the highest quality. The quality of York's teaching has received many accolades. York and Cambridge top the teaching league with the highest scores in official teaching assessments.

The main campus at Heslington is a 200-acre landscaped park, well known for its lake and wildfowl. Here the colleges and academic buildings are on a level site within walking distance of each other. Proximity to the historic city of York makes the University a popular choice and provides a pleasant working and residential environment. The University has plans to expand its campus at Heslington East.

THE DEPARTMENT OF ELECTRONICS

The Department of Electronics at York is one of the leading university Electronics departments in the UK. From the outset the Department has placed a strong emphasis on research and as a result has always been highly rated in external research assessments. Our ability to deliver courses of a high standard in a professional manner has been externally validated recently by the Quality Assurance Agency during their Teaching Quality Assessment, who awarded the Department 24/24.
For more information about the Department of Electronics, please visit the website: http://www.york.ac.uk/depts/elec/

The Department's research activities have engendered a strong Continuing Professional Development programme, with a range of courses that draw upon both in-house academic support and external expertise.

Research activities in the Department of Electronics are organised in four groups:

- **Physical Layer:** Applied Electromagnetics and EMC; Bio-electromagnetics; Electron Optics, Spintronics; Nanotechnology; Radio, Microwave and Optical Circuits.
- **Communications:** Coding and Modulation; Communications and Signal Processing; High Altitude Platforms; Wireless and Satellite Access; Radio Propagation.
- **Media Engineering:** Interaction, Music Technology, Visual Systems Laboratories including Room Acoustics and Acoustics Modelling.
- **Intelligent Systems:** Bio-inspired Architectures; Bio-Applied and Computational Neuroscience; Control Systems.

York EMC Services Ltd

YES Ltd was established in 1995 as a wholly owned subsidiary company of the University of York. YES Ltd provides a unique service comprising: EMC Consultancy, EMC Testing, Continuing Professional Development in EMC and related subjects and specialist EMC Test instrumentation.

EMC research has been carried out in the Department of Electronics, University of York since 1980. The first commercial EMC short course was delivered in 1982 and commercial EMC consultancy and testing were added to the courses provision in 1986.

YES Ltd operates two UKAS accredited EMC testing laboratories located at Castleford in Yorkshire (established in 1996) and Donibristle in Fife (acquired from GEC-Marconi Avionics in 2000). Headquarters are located on the University campus in York. YES Ltd was appointed in 1995 as a European Competent Body, for the compilation and assessment of Technical Construction Files by the DTI. ISO 9001 accreditation for consultancy and research services, including production and associated repair of test instrumentation was added in 2004.

YES Ltd also specialises in EMC instrumentation used by laboratories for the verification/validation processes. This commenced with the Comparison Noise Emitter – CNE, originally developed in 1988 and now the internationally accepted emissions reference source for professional users.

continued

York EMC Services Ltd (YES) is the UK's leading independent provider of laboratory accredited testing services for Electromagnetic Compatibility (EMC) and Low Voltage Electrical Safety (LVD) testing. YES provides award winning **EMC Consultancy and Research** and a range of innovative **EMC Instruments.**

EMC and LVD Testing

To sell in Europe, nearly all products need to carry CE marking, denoting that the requirements of all the relevant European Directives have been met including those for EMC and for electrical safety.

Many manufacturers use the services of our UKAS accredited laboratories to reduce the risk that their products are non-compliant and provide added confidence to place those products on the market.

YES laboratories hold UKAS accreditation for a wide range of International and European standards and operate under the UKAS flexible scope system, ensuring that new standards can often be added to the UKAS schedule at short notice. The latest UKAS schedule is available from our website at http://www.yorkemc.co.uk.

In addition to UKAS accredited testing, YES can also provide pre-compliance and diagnostic testing where a customer requires an indication of whether a product is likely to be compliant. YES employs experienced engineers and technicians who are familiar with the common EMC and LVD problems and their cost effective solutions as well as the more in-depth solutions.

YES laboratories also hold a number of other accreditations, approvals and listings including those of the FCC and VCCI.

For large equipment which cannot be accommodated in the laboratory, an on-site testing service is available. The resulting test report forms an essential part of a Technical Construction File (TCF). The TCF provides manufacturers of large equipment with the most appropriate route to compliance with the European EMC Directive. The results from on-site testing, along with supporting design details and sub-system test results, will form the basis of the TCF. A carefully compiled TCF may well be generic in nature and able to cover a range of similar equipment with little or no additional work.
From 2007 manufacturers will need to compile Technical Documentation (TD) to comply with the new EMC Directive 2004/108/EC. Essentially the TD is similar to a TCF.

Consultancy and Research

Few organisations have all the expertise they need to manage EMC from concept planning through to long-term maintenance, monitoring and future integration planning. York EMC Services offers those capabilities to UK and overseas industry. Our team of highly qualified and experienced consultants can assist you in setting EMC strategies and delivering your EMC objectives.

Our range of services includes:

- Planning EMC management strategies
- EMC Problem Solving
- Hazard Identification and EMC risk assessments
- Multi-disciplinary problem solving including: consultancy, laboratory and on-site measurements and electromagnetic modelling
- Technical Construction File (TCF) compilation and assessment; appointed European Competent Body
- Technical Documentation compilation under the new EMCD 2004/108/EC
- Expert Witness services for EMC
- Antenna design
- EMC Design Techniques
- Development of bespoke measurement techniques
- EM site surveys
- Computational EM Modelling
- Design and development of in-house test facilities, either for pre- or full compliance EMC testing
- Shielding effectiveness calculation and measurement
- Spectrum management; compatibility between radio systems
- Advice on EMC legislation and regulatory issues worldwide

In addition to our own EMC consultants, we have access to world-class expert researchers working at the University of York, experts in fields such as: antenna design, communications and safety critical software. This means that we can field a unique project team of world-class experts able to solve your problem.

Previous experience has included work in the following sectors: rail, automotive, communications, lighting, consumer electronics, defence, oil and gas, process manufacturing industry, built environment and healthcare engineering.

EMC Instrumentation

In addition to regular calibration, often only carried out on an annual basis, it is important that test and measurement set ups are validated on a much more regular basis to ensure that nothing has changed. Possible faults would include a misaligned antenna, an open or damaged cable or connection, or an electronic fault in a receiver or analyser. YES Ltd ranges of noise emitters provide a known source for such validation. Comparison Noise Emitters (CNE) provide continuous noise from 30MHz up to 1, 2, or 7GHz. These are provided with integral antennas though some models also feature direct, 50W outputs. For higher powers and higher frequencies Comb Generator Emitters (CGE) up to 18GHz or 26GHz are available. Physically smaller than CNE's, CGE's are also extensively used to measure the shielding effectiveness of enclosures by providing a known output at high frequencies.

A Harmonic and Flicker Generator (HFG) completes the set of validation equipment providing known levels of harmonic and flicker disturbance to allow test set-ups to be validated.
YES Ltd boasts a proud history of antenna design in association with the University of York. While some designs are now marketed by leading global antenna manufacturers the Active Receive Antenna (ARA) is manufactured and sold by YES Ltd. Featuring bilog equivalent performance in a fraction of the size, the ARA is an essential tool for those needing to carry out emissions measurements in a confined area or requiring portability.

Visit www.yorkemc.co.uk to find your nearest authorised agent. Instruments are available both for sale and for hire.

CPD

THE UNIVERSITY of York

Continuing Professional Development and Training Courses in Electronics

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CPD

THE UNIVERSITY of York

Our courses are part of a complete service comprising CPD, Training, consultancy and research for the 21st century. All this is supported by our product certification services including our UKAS accredited EMC Test laboratories and Competent Body activity.

We provide courses which can be accessed by the whole electronics and communications industry, including the following business sectors:

- Automotive Electronics
- Consumer Electronics
- Industrial Electronics
- Information Technology Hardware Platforms
- Medical Electronics and Healthcare Environment
- Military Electronics
- Nanotechnology
- Railway Industry
- RF and Microwave Telecommunications

Our courses are attended by professionals from SMEs to large industrial companies, the Armed Forces and Government Agencies, and representing countries world-wide.

Our courses are developed and presented by experienced lecturers from the University of York, York EMC Services Ltd and specialist invited lecturers from industry. We pride ourselves on the individual attention we give to our delegates.

Our courses are enhanced by the research and development activities and expertise within the Department of Electronics, the University of York and York EMC Services Ltd.

The historic city of York
http://www.york-tourism.co.uk

York 2 hours from London by GNER train

York 1hour 30 mins from Manchester Airport,
45 minutes from Leeds/Bradford

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