



The IMI Europe Inkjet Summer School is the ideal way to learn more about key aspects of inkjet technology, from the basics through to advanced courses on inks, printheads and applications.

## Inkjet Academy

Theory of inkjet technology

This one-and-a-half day course has been attended by over 3,000 people in the past 17 years. Presented by Mike Willis of Pivotal Resources and Dr Alan Hudd of Alchemie Technology, the course covers all the basics of inkjet technology.

## Digital Textile Printing

Applications, ink chemistry & integration

This course gives an introduction to digital textile printing markets and technology. The main applications for digital textile printing are reviewed, along with the key ink chemistries and integration considerations. This course includes contributions from the University of Ghent, Sensient Imaging Technologies and Catenary Solutions.

## Inkjet Drying & Curing

Hardware & chemistry for fixing inkjet inks

This course covers the requirements for fixing inkjet inks, and covers near IR drying, UV curing and electron beam curing hardware, as well as the required chemistry. The course includes contributions from Phoseon, Adphos, Ebeam Technologies and IGM Resins.

## Fluid Dynamics & Acoustics

How inkjet printing really works

The aim of this course is to couple the characteristics of droplet formation and landing, spreading and permeation to the acoustics of the fluidics of the printhead. The course leader is Prof Dr Frits Dijkman, University of Twente, Netherlands.

## Inkjet Ink Characterisation

Viscosity, dispersions, jetting & surfaces

This course covers rheology and surface tension measurements, particle and dispersion assessment, as well as drop visualisation and print quality analysis. Course leaders include Prof Long Lin of the University of Leeds, Dr Steve Ward-Smith and Gérald Chabanis of Malvern Instruments, and Kyle Pucci of ImageXpert.

## Jetting Functional Fluids

Rheology, deposition, process & development

In this course you can learn how to develop a functional printing application, including inkjet printhead selection, formulating an ink with functional materials and jetting functional fluids onto a substrate. The course is led by Dr Neil Chilton of Printed Electronics Ltd.

# Inkjet Academy

## The theory of inkjet technology

Monday 12 – Tuesday 13 June 2017

### COURSE FOCUS

Basic knowledge of any industry is essential to its development. The Inkjet Academy covers the basic theory behind the many types of industrial inkjet technology used today and aims to give your understanding of the industry an expert start.

On the course you will learn how printheads work, the materials used in their fabrication and the theory of their operation. You'll also find out about inks used

for industrial printing, and how they are formulated and used. Ink supply and support systems and integration issues are also covered.

The course is designed for those with a basic scientific knowledge and will provide useful background information for anyone entering the industrial inkjet industry, seeking an update on today's technology or looking for further fields of development.

### Monday 12 June 2017

12.30 – 13.30 Registration

13.30 Course begins

#### Introduction to inkjet

- Course overview
- Types of inkjet technology
- Drop on demand technologies
- Thermal and piezo inkjet
- Evolution of inkjet markets
- Inkjet patents

#### Inkjet ink technologies

- Ink types: aqueous, solvent, oil, phase change & UV cure
- Dyes & pigments
- Inkjet ink formulations

#### DOD printhead technologies

- Thermal inkjet
- Piezo inkjet
  - » Piston mode designs
  - » Roof mode actuators
  - » Stacked piezo technology
  - » Shear mode designs
  - » Silicon printheads

#### Inkjet ink design

- Inkjet ink design
- Understanding the inkjet printing process
- Drop formation
- Properties influencing piezo inkjet ink performance
- Testing an ink for reliability: methods & characterisation

17:30 Session ends

18:00 - 19:00 Reception

Join us for beers, wines and good company!

### Tuesday 13 June 2017

09.00 Course begins

#### Printhead operational issues

- Drop placement accuracy
- Drop ejection frequency
- Crosstalk
- Reliability
- Life issues

#### Inkjet ink materials and dispersions

- Range of materials and ink chemistries
- Evolution of inkjet inks
- Evolution of dyes
- Pigments and dispersion technology
- Dispersion theory
- Polymers and additives
- Processes and manufacturing

#### Print & image quality

- Factors affecting print quality
- Printhead-ink-substrate
- Greyscale methods

#### UV Ink chemistry and curing

- UV curable materials
- Monomers
- Oligomers
- Photoinitiators
- UV curing
- Print quality issues with UV inks

12.30 – 13.30 Lunch

13.30 Session begins

#### System design issues

- Industrial ink supplies
- Bubble control
- Nozzle maintenance

#### Inkjet applications

- Coding, marking, mailing, addressing
- Wide format graphics
- Industrial decoration – décor & laminates
- Ceramic tiles
- Textiles
- Commercial printing
- Labels & packaging
- Printed electronics, bio-medical & 3D printing

#### Emerging technologies

- Kodak Stream
- Memjet
- HP PageWide technology
- Landa Nanography
- Lead-free piezo
- Speed & resolution trends

17.30 Course ends

Alchemie

pivotal  
resources

### COURSE LEADERS

#### Mike Willis

Pivotal Resources Ltd

Mike Willis is the Founder and Managing Director of Pivotal Resources, an international marketing and technical consultancy specialising in digital printing. He has worked in this industry for the past 30 years, accumulating considerable experience in a wide range of imaging technologies.

Recognised as an industry expert, he regularly speaks and gives tutorials at printing conferences in Europe and North America. In addition he is the publisher of Directions, a service that monitors inkjet patents and significant product launches.

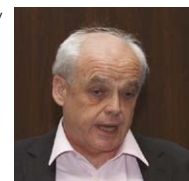


#### Dr Alan Hudd

Alchemie Technology Ltd

Dr Hudd is Director and co-founder of Alchemie Technology Ltd. Alchemie is an independent contract development and consultancy company to the industrial inkjet industry. Alchemie is also developing and commercialising a range of novel printhead technologies through its Joint Venture company, Jetronica. Jetronica specialises in supplying solutions to selectively pattern liquids and powders capable of using a wide range of chemistries from graphene through textile pre-treatments and 3D printing of metal powders to drugs for implantable drug devices.

Alan Hudd was the Founder and Managing Director of Xenica Technology from 1996 to 2012.





# Fluid Dynamics & Acoustics

## How inkjet printing really works

Monday 12 – Tuesday 13 June 2017

### COURSE FOCUS

Inkjet printing is a process of depositing on demand small droplets with a specified volume onto a precise location on a substrate. This definition covers a wide variety of applications like document printing, label printing, 3D printing, and functional applications like patterning of displays and biosensors. During the course we follow the ink all the way through the printhead, through droplet formation and on to landing on the substrate.

The course is mainly restricted to piezo-driven printheads jetting Newtonian inks, although the issue of viscoelastic inks will be discussed. A piezo-driven printhead is a set of acoustic cavities, the characteristics of which will be presented in the time (response to waveforms) and frequency domain.

The course is based on precise descriptions of the physical phenomena involved and on the derivation of the mathematical framework needed to solve the governing equations. Where possible the outcomes will be compared with experimental findings. Different mathematical methods will be presented to calculate the responses of different systems in the frequency and time domain. To describe correctly the behaviour of a printhead with a large number of narrow pitched nozzles, the long duct theory will be presented.

The aim of this course is to couple the characteristics of droplet formation and landing, spreading and permeation to the acoustics and microfluidics of the printhead. The knowledge conveyed during the course will enable the participants to analyse the behaviour of a wide variety of existing printheads and to support the development of new printheads and inks from a physics point of view.

### Monday 12 June 2017

12:30 - 13:30 Registration

13:30 Course begins

#### General introduction

- Introduction on physics & mathematics
- Basic concepts (single degree of freedom system)
  - Waveforms
  - Fluid dynamics
  - Mathematics

#### Different piezo designs

- Helmholtz theory and waveforms (two and five degree of freedom systems)
  - Single nozzle printheads
  - Multi-nozzle devices

17.30 Session ends

18.00 - 19.00 Reception

Join us for beers, wines and good company!

### Tuesday 13 June 2017

9:00 Course begins

#### Theoretical considerations

- Long duct theory
- Droplet formation
- Speed of sound
- Damping
- Refilling

12:30 - 13:30 Lunch

13:30 Session begins

#### Further considerations

- Maximum jetting frequency
- Drag on droplets
- Droplet impact and spreading
- Jetting of viscoelastic inks
- Examples: polyLED display printing, printing of biomolecules (co-authored by Dr Anke Pierik, Philips Research)

17:30 Course ends

### COURSE LEADER

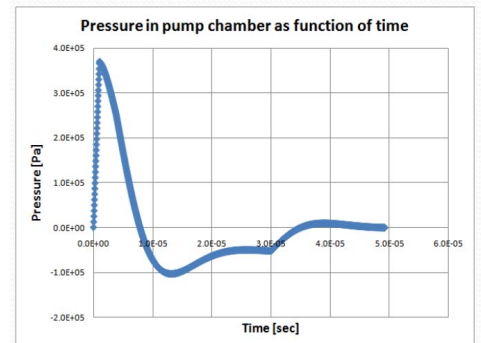
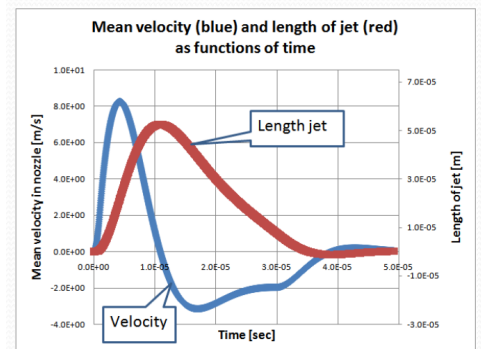
#### Prof Dr J Frits Dijkman

University of Twente, Faculty of Science and Technology, Netherlands

Prof Frits Dijkman is professor of biomedical applications of inkjet technology at the University of Twente, Netherlands.



He has worked with Philips Research for more than 30 years and his main area of interest has been inkjet technology for consumer and non-consumer applications, such as PolyLED display manufacturing and the printing of biomolecules.



## Ghent Boat Tour

Join us for a boat excursion on the canals that circulate through the beautiful medieval city of Ghent. The tour will be on the evening of 13 June, and is free for all attendees of the Inkjet Summer School.



# Inkjet Ink Characterisation

## Viscosity, Dispersions, Jetting & Surfaces

Wednesday 14 – Thursday 15 June 2017

### COURSE FOCUS

Development of high quality inks and fluids for inkjet applications requires state-of-the-art characterisation equipment and techniques. From fundamental ink properties such as viscosity and surface tension, which have a crucial impact on jetting performance, through analysis of particulates dispersed within the ink, understanding these properties is key to getting the best out of an ink development project. In addition, it is vital to understand how the developed ink actually behaves, both on ejection from the printhead and when landing onto the substrate of choice.

The Inkjet Ink Characterisation course gives an excellent introduction to these essential areas of study, presented by industry experts from leading suppliers and institutions in the field. The course will give you the basic foundations as well as a more detailed understanding of the vital equipment and techniques.

### Wednesday 14 June 2017

08:00 - 09:00 Registration

09:00 Course begins

#### Basic property measurements - rheology

Gérald Chabanis, Malvern Instruments

- Rheology - introduction
- Basic techniques
- Pros and cons
- Theory of measurement
- Rheology in action

#### Surface tension - what, why and how?

Prof. Long Lin, University of Leeds

- Surface tension - definition and variations
- Relevance to inkjet printing
- Relation to rheology
- Impacts on wetting, spreading, drying and adhesion
- Theories and methods of measurement - compared and contrasted
- Examples of application

12:30 - 13:30 Lunch

13:30 Session begins

#### Particle analysis

Dr Steve Ward-Smith, Malvern Instruments

- Particle analysis - introduction
- Basic techniques
- Pros and cons
- Light scattering - the science
- Practical examples

17:30 Session ends

18:00 - 19:00 Reception

Join us for beers, wines and good company!

### Thursday 15 June 2017

09:00 Session begins

#### Jetting and print quality analysis

Kyle Pucci, ImageXpert

- Introduction to drop analysis
- How is in-flight analysis used
  - Drop formation
  - Reliability
  - Misting
  - Nozzle-to-nozzle consistency
  - Drop measurement
- Simple application examples
- Overview of techniques
- Fundamental measurements
- Practical demonstration
- Introduction to print quality analysis
- How is print quality analysis used
  - Dot properties
  - Line properties
  - Solid area quality
  - Colour registration
  - Ink interaction
- Overview of techniques
- Practical examples

12:30 Course ends

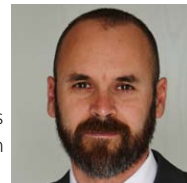


### COURSE LEADERS

#### Gérald Chabanis, Rheology Customer Support Specialist

Malvern Instruments GmbH

Gérald Chabanis gained a degree in chemistry at FH Münster in Germany. He joined Bohlin Instruments in 2001, moving to Malvern Instruments with the acquisition of Bohlin in 2003. Between 2007 and 2015, Gérald was responsible for technical, application and sales support to distributors for the Malvern rheometers product line. He is now Customer Support Specialist covering technical and application support as well as rheology training and seminars.



#### Prof Long Lin, Head of Department of Colour Science

University of Leeds

Long Lin is the Head of Department of Colour Science at the University of Leeds, and the Founder and Director of the Digital Print Centre of Industrial Collaboration and the Colour and Textile Science Centre. He has over 25 years of industrial R&D experience, mostly in printing and colour-related industries. Current research interests include functional materials for printed electronics, security, energy storage and medical applications.



#### Dr Steve Ward-Smith, Key Account Technical Specialist

Malvern Instruments

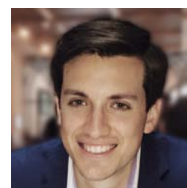
Steve Ward-Smith is a Key Account Technical Specialist at Malvern Panalytical where he has worked for 22 years. He has a degree in Chemistry from Manchester University, a Masters in Biomolecular Technology from Leicester University and a PhD in Physical Chemistry & Colloid Science from Nottingham University. He started as the Mastersizer technical specialist in 1995, and now looks after Malvern's key customers worldwide.



#### Kyle Pucci, Applications Engineer

ImageXpert

Kyle is an Applications Engineer at ImageXpert Inc. and lives in Nashua, NH USA. He graduated in 2014 from Villanova University with a B.S. in Mechanical Engineering. He specialises in integrating controllers and hardware with the JetXpert dropwatcher and offering support, installation, and training.





# Digital Textile Printing

## Applications, Chemistry & Integration

Wednesday 14 – Thursday 15 June 2017

### COURSE FOCUS

Over the last decade digital textile printing using inkjet technology has been introduced for a wide range of applications. Many of the technical and material challenges have been overcome, and the increasing emphasis on cost saving, manufacturing flexibility and following market trends is generating a surge of interest.

The course will give an overview of the industry, the markets, applications and technology. The various ink chemistries available will be described, and how they can be used in inkjet printheads. Integration of inkjet technology within a production environment will also be considered, as well as the challenges of inkjet system design to make the processes production-capable.

### Wednesday 14 June 2017

08:00 - 09:00 Registration  
09:00 Course begins

#### Digital textile printing technology and applications

Marc van Parys, University of Ghent

- Segmentation of the market - home textiles, apparel, industrial applications, & soft signage
- Growth of digital textile printing - in the different segments
- Applications and partnership
- Market developments under the influence of digital inkjet printing technology
- Workflow - an important part in production to create or save cost
- Business drivers
- Future directions

12:30 - 13:30 Lunch  
13:30 Session begins

#### Digital textile inks

Dr Simon Daplyn, Sensient Imaging Technologies

- Materials selection
- Dyes vs pigments
- Designing ink for industrial printheads
- QC and performance
- Application requirements
- Inkjet printing process
- Designing for digital
- Ink and fabric selection
- Processing requirements
  - Fabric preparation
  - Fixing
  - Washing
- Colour characteristics (ink and print)
- Ink maintenance and support requirements

17:30 Session ends  
18:00 - 19:00 Reception

Join us for beers, wines and good company!



### Thursday 15 June 2017

09:00 Session begins

#### Integration for digital textile printing

Dr Tim Phillips, Catenary Solutions

- Hardware integration
- Printhead technologies
- Printhead choices
  - Suppliers
  - Performance
  - Life issues
- System design
  - Ink supply systems
  - Nozzle maintenance
  - Designing for reliability
- Architecture options
- Printhead motion systems
- Web handling and textile transport
- Testing
- Print quality

12:30 Course ends

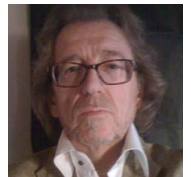


### COURSE LEADERS

#### Prof Dr em Marc van Parys

Professor of Textiles, University of Ghent

Prof Van Parys is a Doctor in Chemistry and Professor of Textiles at University College Ghent and University of Ghent. He is Head of the Textile Department and the textile research Lab TO2C. Marc is also president of UNITEX (an SME textile association in Belgium and Netherlands), organiser of international congresses and chief editor of the UNITEX journal. Marc is also a senior consultant and member of the board at Centexbel, and owner and founder of TexZeppelin, a consultancy company covering emerging technologies including digital printing, UV-LED coating/printing, plasma and laser treatment and nanotechnology.



#### Dr Simon Daplyn, Product Manager Inks

Sensient Imaging Technologies, UK

Dr Simon Daplyn has been at Sensient (formerly Xennia Technology) since 2008. Simon has a particular focus on textile solutions for decoration and functional finishing. Previously Simon oversaw the development of advanced industrial inkjet solutions across a wide range of applications including biomedical, electronics and product decoration. Simon has been in inkjet for 12 years, starting with a PhD on Digital Printing for Textile Decoration. After this he was Technical Manager at Nanojet Ink involved in design, development and manufacture of inkjet inks and innovative coatings.



#### Dr Tim Phillips, Founder & Director

Catenary Solutions, UK

Tim Phillips has extensive experience in challenging inkjet integration projects, spending eight years working at inkjet solutions company Xennia Technology. Projects covered textiles, ceramics, packaging, décor and functional material deposition. Tim is an experienced presenter of IMI Europe courses including Inkjet Academy, Inkjet Ink Manufacturing & Digital Textile Printing. Tim founded Catenary Solutions in 2015 to bring this knowledge of digital solution development and marketing to a wider audience. Tim has a degree in Natural Sciences from the University of Cambridge, and a PhD in liquid crystal physics and chemistry from the University of Bristol.



# Inkjet Drying & Curing

## Hardware & Chemistry For Fixing Inkjet Inks

Thursday 15 - Friday 16 June 2017

### COURSE FOCUS

The Inkjet Drying & Curing course is intended to cover all of the necessary hardware and ink chemistry for fixing inkjet inks. The course will cover drying of aqueous and solvent inks, comparing different possible methods and including near-infrared (NIR) drying, ultra violet light (UV) curing and electron beam (EB) curing. The course covers both hardware and chemistry in detail.

The drying section will review the ink drying process, including adhesion, penetration into the substrate, rub resistance and print quality. The differences in behaviour on porous and non-porous media will be discussed. Wavelength,

absorption characteristics of inks, typical substrates and coatings will also be covered. The advantages and disadvantages of potential ink drying techniques will be reviewed.

The course gives an in-depth introduction to the UV curing process and its relevance to digital inkjet printing. The course introduces the fundamental chemistry and hardware required, assessing the pros and cons of each type available on the market. Finally the emerging technique of EB curing will be introduced, and its potential advantages reviewed.

### Thursday 15 June 2017

12:30 - 13:30 Registration

13:30 Course begins

#### Drying aqueous and solvent inks

- Review of the drying process
  - Adhesion and penetration effects
  - Rub resistance
  - Print quality
- Porous and non-porous media
- Absorption characteristics of inks
  - Wet vs. dry inks
  - Substrate and coating effects
  - Effect of water
- Review of drying techniques
  - Direct contact
  - Convection
  - Radiative drying
- Near-IR drying - benefits and trends

17:30 Session ends

18:00 - 19:00 Reception

Join us for beers, wines and good company!

### Friday 16 June 2017

09:00 Session begins

#### UV curing fundamentals

- Introduction to UV Curing
  - The UV curing process
  - Chemistry
  - UV Sources
    - Arc lamps
    - Microwave
    - LED
- Characterising UV Sources
  - Wavelength
  - Peak irradiance
  - Energy density
  - Air-cooled systems
  - Water-cooled systems
- Application areas
  - Full cure
  - Pinning
  - Inkjet printing
  - Coating
  - Low migration
- Benefits of UV curing
- Latest advances in UV technology

12:30 - 13:30 Lunch

13:30 Session begins

#### Electron beam curing

- Introduction to electron beam (EB) curing
  - The EB curing process
  - Chemistry and physics
  - EB Sources
    - Lamps
    - Systems
- Characterising EB Sources
  - Beam current
  - Dose
  - Voltage
  - Power
- Application areas
  - Conventional printing
  - Inkjet printing
  - Coating and varnishes
  - Migration results
- Benefits of EB curing
- Comparison with UV technology
- Future perspectives

#### UV cure chemistry

- UV cure mechanisms
  - Free radical
  - Cationic
- Photoinitiator chemistry
- Monomer chemistry
- Oligomers and additives
- Curing issues
  - Oxygen inhibition
  - Other issues
- Print quality effects with UV inks

17:30 Course ends

### COURSE LEADERS

#### Martin Doherty, Sales Director Europe - Print Technology

Adphos Innovative Technologies

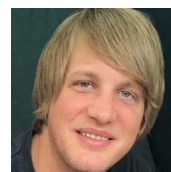
With over thirty years dedicated to printing generally, and over twenty to digital inkjet specifically, Martin has much knowledge of the process. As the sales lead for Adphos in the digital printing arena he is keen to share the benefits of this experience to enhance the performance of products in the design stage and those already installed in the field.



#### James Burbidge, Technical Director Europe - Print Technology

Adphos Innovative Technologies

James has ten years of experience in the digital printing field, as a key technical trouble shooter for a market-leading manufacturer of digital colour presses, and as technical lead in a large digital printing company. He now brings that experience to bear in enhancing the performance & productivity of production lines by integrating Adphos technology.



#### Dirk Exner, European Account Manager

Phoseon Technology

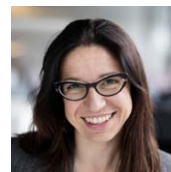
Dirk Exner is European Account Manager for Phoseon and has been with them since 2010. He has an engineering degree from the University of Applied Sciences Cologne, is married and has two children. Before joining Phoseon, he worked for colour management specialist X-Rite in various positions and prior to that for inkjet printhead manufacturer Xaar.



#### Dr Elsa Callini, Business Development Manager

Ebeam Technologies

Elsa Callini got her PhD in Physics from the University of Bologna, after being a Visiting Research Student at the Chemistry Department of Aarhus University (D) and Guest Student at the California Institute of Technology (USA). After having carried out her research at Empa in Duebendorf (CH) and at the Ecole Polytechnique Federale de Lausanne (CH), she is now Business Development Manager at ebeam Technologies, part of COMET AG.



#### Dr Stuart Palmer, Sales Manager

IGM Resins

After obtaining a degree and PhD in Chemistry (University of Kent, Canterbury, UK), Stuart worked in UV-curing technology at Autotype and Fujifilm SIS (then known as Sericol). He then spent 10 years working in chemical distribution, which exposed him to many other coating technologies. He joined IGM Resins, a company dedicated to producing raw materials for UV curing, in 2008.





# Jetting Functional Fluids

## Rheology, Deposition, Process & Development

Thursday 15 - Friday 16 June 2017

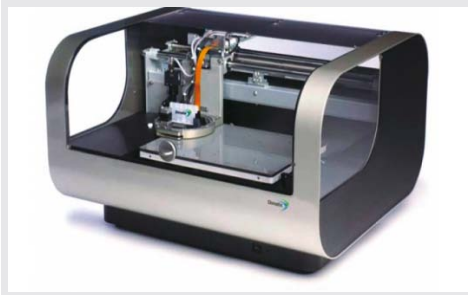
### COURSE FOCUS

There is no doubt that digital deposition of fluids containing functional materials, using inkjet heads is an extremely attractive proposition: being able to place a tiny and highly controlled amount of fluid to a few microns of placement accuracy has the potential to transform conventional manufacturing processes. Whether the functional fluids have electronic, pharmaceutical or other attributes, the challenges of getting them to "jet" with suitable performance and to "functionalise" on the target substrate are common headaches for the material deposition community.

In this course we will focus on the practicalities of inkjet printing of these challenging fluids. We will consider in detail the basic building blocks of a material deposition inkjet system: the inkjet printheads, the ink or fluid, the motion platform and the substrate. We will look at the methods available to create printed structures that deliver the required performance. In addition we will provide a background on fine-tuning inks and their jetting waveforms to improve performance. The course will also provide a sometimes salutary background on the conventional manufacturing capabilities that must be matched for material deposition by inkjet to move into large scale production environments.

### LIVE DEMONSTRATIONS

As part of the course, Neil will be carrying out demonstrations using a Dimatix DMP deposition system - your chance to see this deposition platform in action, including built in drop-watcher.



### COURSE LEADER

#### Dr Neil Chilton, Technical Director

Printed Electronics Limited

Neil has more than twenty years' experience in the field of electronics and electronic components. After completing his BSc and PhD in Physics, his technical career took him to Japan where he worked for four years at the advanced materials research division of Nippon Steel Corporation.



After returning to the UK he joined Europe's then largest printed circuit board manufacturing company where he was later part of an MBO team and technical director. In 2006 together with co-founder Dr Steve Jones, he started Printed Electronics Limited to focus on the practical use of inkjet for manufacturing electronic interconnects, devices and systems.



### Thursday 15 June 2017

12:30 - 13:30 Registration  
13:30 Course begins

#### The basic components of an inkjet system for functional fluid deposition

- Heads
  - Choice of inkjet heads
  - Material compatibility
  - Drive electronics and systems
  - Selection criteria for inkjet heads
- Inks
  - Basic tests for potential inkjet inks and re-formulation options
  - Jetting methods to evaluate ink performance
- Inkjet platform
  - Buy or build?
  - Fundamental choices when deciding on a system
  - Accuracy and compensation methods
  - Control software considerations
- Substrate
  - Fundamentals of the substrate – ink interaction
  - Practical substrate characterisation
  - How to optimise your patterning
  - Surface treatment options
- Functionalising
  - Making the printed fluid into the printed "thing" you need
  - Thermal vs photonic methods for nano-metal materials
  - UV methods for dielectric type materials

17.30 Session ends

18.00 – 19.00 Reception

Join us for beers, wines and good company!

### Friday 16 June 2017

09:00 Session begins

#### Inkjet image fundamentals

- A primer on printing bitmap images (when you really want a nice vector)
- What is a bitmap?
- Encoders and drive systems
- Resolution and image conversion
- Dealing with image artifacts
- Software techniques

#### Ink delivery and ink management systems

- Filtration, heating/cooling, degassing and ink delivery
- Customised and commercial ink delivery systems

12:30 - 13:30 Lunch

13:30 Session begins

#### Practical applications and case studies

- Examples and lessons learnt
- Hands on with inkjet components

#### Moving functional printing to industrial scale

- System considerations, yield requirements and cost modelling

#### An overview of material deposition and printed electronics using inkjet

- Things that can (and maybe cannot) be done

17:30 Course ends

