

## Booking form

### Surface engineering and coatings

22 - 26 February 2010

#### Course fee: £1380

Discounted rates are available for members of professional bodies/trade associations, and group bookings. Details available on request.

Surname \_\_\_\_\_

First name \_\_\_\_\_

Prof  Dr  Mr  Mrs  Miss

Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

Telephone no \_\_\_\_\_

Fax no \_\_\_\_\_

E-mail address \_\_\_\_\_

#### Payment

- Please find enclosed a cheque for  
£ \_\_\_\_\_  
payable to Cranfield University
- Please invoice my company for the full  
amount £ \_\_\_\_\_
- Please debit my credit card Visa /  
Mastercard

Card no

Start date

Expiry date

Issue no

Three digit security code (on reverse of card)

Amount £ \_\_\_\_\_

Name of cardholder \_\_\_\_\_

Signature \_\_\_\_\_

Date \_\_\_\_\_

Please state any special dietary requirements \_\_\_\_\_

#### Course fee

The fee covers attendance, lunch, delegate coffee breaks and full meeting documentation. The fee does not cover travel or accommodation.

#### Cancellations and substitutions

It is regretted that cancellations and refunds cannot be made. However, the organisers will accept substitutions provided that written notification is received.

- Data protection** Please tick this box if you do not wish your details to be held by Cranfield University for the purpose of marketing courses, conferences, research programmes and other associated activities.

For further information contact the Academic Operations Unit:

T: +44 (0) 1234 754176

F: +44 (0) 1234 751206

E: [shortcourse@cranfield.ac.uk](mailto:shortcourse@cranfield.ac.uk)

Please detach and return this form to:

Academic Operations Unit, Cranfield University,  
FREEPOST BF463, Bedfordshire, MK43 0AL  
UK.

## Speakers

### John Nicholls

Professor of Coating Technology and Head of the Surface Science and Engineering group at Cranfield University. John has over 30 years experience in coatings technology, gaining an international reputation for his studies in high temperature oxidation and corrosion and in the design of coating systems to combat high temperature corrosion, erosion and wear.

### Sue Impey

Head of the Materials Characterisation and Surface Analysis team at Cranfield University and Programme Director of the Materials suite of Masters level courses (including Advanced Materials, Microsystems and Nanotechnology, and Welding Engineering). Dr Impey has conducted research in oxidation and corrosion aspects of liquid metals for the casting industry, high temperature coatings for the aerospace industry, and ferroelectric ceramics and thin films for the microelectronics manufacturing industry.

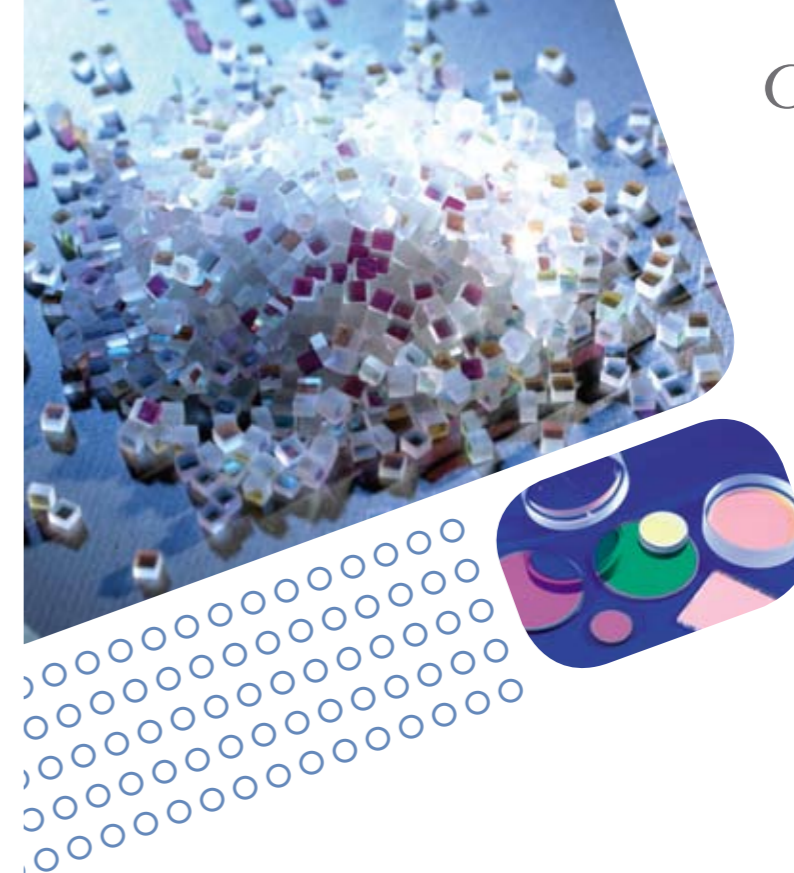
### Ken Lawson

Ken Lawson is Coatings Services Manager at Cranfield University. Ken's current research includes projects involving coatings for the gas turbine industry, thin film shape memory alloys and coatings for low temperature applications.

#### Contact

For further details including registration information please contact:

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Bedfordshire MK43 0AL, UK  
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# Surface engineering and coatings

Industrial short course, Cranfield University

22 - 26 February 2010

## Introduction

Cranfield University offers this five day short course which aims to provide an understanding of the role that surfaces play in materials behaviour, including on optical applications of coating systems.

The course also aims to introduce the concepts of surface engineering and how it may be used to optimise a component's performance. Analytical techniques used to evaluate and characterise surfaces and thin film samples are introduced.

### Benefits of attending

- Understanding of the concepts of surface engineering
- Knowledge of the alternative technologies used to fabricate coating systems
- Knowledge and understanding of physical vapour deposition and chemical vapour deposition
- Knowledge of plasma/surface interactions and their relevance to industry
- Understanding of optical coating design
- Ability to evaluate the microstructure characteristics used to describe materials
- Knowledge of the techniques used to characterise the surface and the principals behind their operation.
- Critical awareness of current research.

### Course content

- Philosophy of surface engineering, general applications and requirements
- Principles and design of optical coatings
- Physics of the plasma state and plasma surface interactions
- Surface engineering as part of a manufacturing process
- Integrating coating systems into the design process
- Coating manufacturing processes: Electro deposition, Flame spraying, Plasma spray, Physical vapour deposition, Chemical vapour deposition, HIP surface treatments, Sol-gel coatings, Spin coating methods
- Analytical Techniques: X-ray diffraction, TEM, SEM and EDX, WDX analysis, surface analysis by AES, XPS and SIMS, overview of other techniques
- Data interpretation and approaches to materials analysis
- Coating systems for optical applications
- Multilayered coating architectures
- Anti-reflection coatings
- Wavelength selective coating design.

### Who should attend?

Engineers and scientists working in the optics, optoelectronics, semiconductor, aerospace, automotive, space, displays and medical device industries. It is highly appropriate to those involved in the design, development, manufacture and application of coatings technology across a range of commercial products.

### Venue

Cranfield University, Cranfield, Bedfordshire, MK43 0AL

## Programme

### Day one

- 09.00 **Introduction** – John Nicholls
- Course aims and objectives
- 09.55 **Electroplating** – John Nicholls
- The electro-deposition process
  - Good plating practice
- 10.55 Break
- 11.10 **Theoretical Design of Optical Coatings** – Ken Lawson
- Introduction to coatings design
  - Basic design principles and theory
- 13.05 Lunch
- 14.15 **Analytical techniques I** – Sue Impey
- X-ray diffraction and x-ray fluorescence
  - Overview of scanning electron microscopy
  - Transmission electron microscopy
  - Surface analysis and nano approaches to materials characterisation
- 16.25 **Analytical techniques I (continued)** – Sue Impey
- X-ray photo-electron spectroscopy
  - Auger electron spectroscopy
  - Scanning ion mass spectrometry

### Day two

- 09.00 **Auto catalytic deposition** – John Nicholls
- Anodising processes
  - Auto catalytic deposition
  - Electroless nickel coatings
- 09.55 **Physical vapour deposition** – John Nicholls
- PVD processes
  - Evaporation processes
- 10.55 Break
- 11.10 **Theoretical design of optical coatings** – Ken Lawson
- Advanced concepts
  - Practical design considerations
- 13.05 Lunch
- 14.15 **Analytical techniques II** – Sue Impey
- Scanning electron microscopy (SEM)
  - Environmental SEM
- 16.25 **Analytical techniques II (continued)** – Sue Impey
- X-ray spectroscopy

### Day three

- 09.00 **Physical vapour deposition** – John Nicholls
- Sputter deposition
  - Ion beam techniques
- 09.55 **Chemical vapour deposition** – John Nicholls
- Chemical vapour deposition processes
  - Plasma assisted CVD
  - Summary of vapour deposition methods
- 10.55 Break
- 11.10 **Problems in optical design** – Ken Lawson
- Practical design issues
- 12.10 **RAPT processing I** – John Nicholls
- Non-conventional processes
  - Introduction to Reactive Atom Plasma techniques
- 13.05 Lunch
- 14.15 **Tour of Surface Engineering and Coatings facilities** – John Nicholls and Ken Lawson

### Day four

- 09.00 **Optical applications of coatings** – Ken Lawson
- The application of optical coatings across a range of industries
- 10.55 Break
- 11.10 **Laboratory demonstration of RAPT machine**
- Practical demonstration of the RAPT process, using equipment within the Cranfield University Precision Engineering laboratories.
- 13.05 Lunch
- 14.15 **Engineering durability of optical coatings** – John Nicholls
- Limitations of optical coatings
  - Practical durability

### Day five

- 09.00 **Surface engineering practice and design** – John Nicholls
- Surface design
  - Engineering surface functionality
- 10.00 **RAPT processing II** – John Nicholls
- Practical applications
  - Future prospects
- 10.55 Break
- 11.10 **Application and design for manufacturing aspects of optical coatings** – Industrial speaker
- Manufacturing considerations
  - Issues of compromise to design
  - Design for manufacture