

## Booking form

### CAE for Ultra Precision

7 - 11 December 2009

#### 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

### Ian Walton

An experienced Research Officer at Cranfield, leading the development of high performance grinding processes for aerospace, automotive and optical components. He is also the Research Manager for the Cranfield Innovative Manufacturing Research Centre (IMRC).

### Paul Morantz

Senior Research Fellow at Cranfield. Paul has considerable industrial experience in precision machine tool development.

### Tan Jin

An experienced Research Fellow at Cranfield heavily engaged in developing research into high efficiency grinding of aerospace, automotive and optical materials.

### Kamal Sehdev

Course Director of the MSc in Organisational Knowledge, Kamal lectures in Organisations and Knowledge and Enterprise Modelling. His research interests focus on the application of knowledge to improve business performance.

#### Contact

For further details including registration information please contact:

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[www.cranfield.ac.uk/sas/short](http://www.cranfield.ac.uk/sas/short)



# Computer-Aided Engineering for Ultra Precision

Industrial short course

7 - 11 December 2009

## Introduction

Cranfield University offers this five day introductory short course in computer-aided engineering (CAE) for ultra precision which aims to provide understanding and experience of the computer technologies that enable integrated precision manufacture. A 'learn-by-doing' approach through carefully defined tutorials is used.

### Benefits of attending

On completion of the course, delegates will gain:

- Fundamental knowledge and understanding of, and ability in, the development of complex 3D CAD model
- Critical awareness and understanding of the mechanism for transferring from CAD through CAM and into CNC machining mode
- Understanding of and the ability to critically apply FEA design tools to support structural (dynamic) and thermal response
- Understanding and conceptual thinking in terms of the selection, critical evaluation and application of dynamic system testing methods for precision mechanical systems.

### Who should attend?

- New engineers, scientists and technologists working in the design and manufacture of machined parts, components, assemblies and sub-systems for a range of industrial products
- Engineers new to computer-aided engineering technologies

### Course content

- 3D computer-aided design of complex form ultra precision parts
- Computer-aided manufacture approaches, coding of 3D CAD models and drawings, automated manufacture using advanced multi-axes CNC machining methods including fixture design and datum transfer issues
- Finite element analysis techniques applied for both dynamic response (stress) analysis and heat transfer/thermal distortion analysis.
- The critical importance of interfaces with regard to heat transfer and structural damping
- Machine system structural analysis covering the identification of mechanical structural resonance frequencies and motional control bandwidth distinct frequency responses
- Use of position sensors/transducers within computer-based systems for verification of ultra precision machines/systems.

### Day one

- 09.00 **Introduction to CAM** - Ian Walton
- What is CAM
  - How is it applied
  - Concepts
- 10.55 Break
- 11.10 **Practical tutorial on CAM I** - Tan Jin
- Step by step tutorial to produce a CNC tool path for a micro-milled component
- 13.05 Lunch
- 14.15 **Practical tutorial on CAM II** - Tan Jin
- Step by step tutorial to produce a CNC tool path for a micro-milled component
- 16.10 Break
- 16.25 **Practical tutorial on CAM III** - Tan Jin
- Step by step tutorial to produce a CNC tool path for a micro-milled component

### Day two

- 09.00 **Introduction to CMM applications** - Paul Morantz
- Principles of how a CMM can be integrated into a manufacturing process
- 10.55 Break
- 11.10 **Practical tutorial on integrated CMM and CAD/CAM I** - Paul Morantz
- Introduction to PC-DMIS
  - Practical integration of CMM into the CAD/CAM process
- 13.05 Lunch
- 14.15 **Introduction to portable metrology** - Ian Walton
- Principles of using an encoded system
- 16.10 Break
- 16.25 **Practical tutorial** - Ian Walton
- Comparing a CAD model to a real part

### Day three

- 09.00 **Introduction to CAD** - Kamal Sehdev
- Why use CAD?
  - Introduction to CAD 'Ideas' software
  - Concepts of CAD
- 10.55 Break
- 11.10 **Practical CAD** - Kamal Sehdev
- Worked examples
- 13.05 Lunch
- 14.15 **From Model to Manufacture I** - Ian Walton
- Applying CAD/CAM to a precision milled component
- 16.10 Break
- 16.25 **From Model to Manufacture II** - Ian Walton
- Applying CAD/CAM to a precision milled component



### Day four

- 09.00 **Practical tutorial on CAD** - Kamal Sehdev
- Worked examples
- 10.55 Break
- 11.10 **Practical tutorial on CAD I** - Kamal Sehdev
- Generating a 3D CAD component
  - Constraining the model
- 13.05 Lunch
- 14.15 **Practical tutorial on CAD II** - Kamal Sehdev
- Modifying the component
  - Understanding the history tree
- 16.10 Break
- 16.25 **Practical tutorial on CAD III** - Kamal Sehdev
- Worked examples

### Day five

- 09.00 **Introduction to, and practical tutorial on, Finite Element (FEA) modal analysis** - Tan Jin
- Introduction to FEA
  - Basic concepts of FEA
  - Analysis of a simple structure/component
- 10.55 Break
- 11.10 **Practical tutorial on FEA - Modal Analysis** - Tan Jin
- Analysis of a simple structure/component
- 13.05 Lunch
- 14.15 **Practical tutorial on FEA - Thermal interfaces I** - Tan Jin
- Analysis of a simple structure/component
- 16.10 Break
- 16.25 **Practical tutorial on FEA - Thermal interfaces II** - Tan Jin
- Analysis of a simple structure/component