

## **Course aims**

The development of composite materials for use in high performance engineering applications is of particular current interest. Realisation of the full potential of composites depends, however, upon the maintenance of the intended structure through manufacturing processes and in use. Thus, as with other high performance materials, it is often necessary to use non-destructive evaluation (NDE) to identify and quantify potential problems in materials or structures.

The course aims to introduce participants to the full range of NDE techniques currently available, including ultrasonics, low frequency methods, X-radiography, image enhancement, acoustic emission, shearography and thermography.

## **Course objectives**

At the end of the course delegates should know how to identify faults or inhomogeneities; indicate early signs of failure; monitor damage; and assess fitness for service.

## **Course requirements**

No formal academic requirements are needed, but an HND or degree in engineering or science should provide adequate background knowledge. Applicants should have a reasonable knowledge of fibre-reinforced plastic composites (constituents, manufacturing methods, applications, properties) gained through formal education or experience.

No prior knowledge of NDE is required.

## **Course structure**

The course takes place during the second week in November every year. Details of the next course can be found at:-

<http://www.qinetiq.com>

A series of lectures is followed by demonstration periods, which should allow a degree of "hands-on" experience.

The final day of the course is devoted to manufacturers' demonstrations of state-of-the-art NDE equipment.

Delegates are encouraged to bring problem specimens of their own to stimulate discussion at the optional workshop on Friday morning.

Delegates will receive a Certificate of Attendance on completion of the course.

## **Who should attend?**

This course would be of value to engineers, materials scientists, and physicists with current interests in composite materials, either recent graduates or experienced technical personnel, who would like to gain a conceptual and practical appreciation of a wide variety of NDE methods.

## **Continuing professional development**

Continuing Professional Development (CPD) is the systematic maintenance, improvement and broadening of knowledge and skills, and the development of personal qualities necessary for the execution of professional, managerial and technical duties throughout the practitioner's working life. The course is recognised for CPD by The Institute of Materials, Minerals and Mining, and The Institute of Physics.

# NON-DESTRUCTIVE EVALUATION OF COMPOSITE MATERIALS

*A 3-Day Short Course  
of Lectures, Demonstrations and Practice*

**Organised by QinetiQ  
In collaboration with  
The Composites Centre at Imperial College**

Co-sponsored by the British Institute of Non-Destructive Testing  
and recognised for CPD by  
The Institute of Materials, Minerals and Mining  
and The Institute of Physics

Enquiries should be directed to:

Mrs Christine Giles,  
A7 Building, Room 2008  
QinetiQ  
Cody Technology Park  
Ively Road  
Farnborough  
Hampshire, GU14 0LX  
Tel +44 (0)1252 397478 Fax +44 (0)1252 394006  
E-mail: [cgiles@qinetiq.com](mailto:cgiles@qinetiq.com)

# NON-DESTRUCTIVE EVALUATION OF COMPOSITE MATERIALS

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**14, 15, 16 November 2006**

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**QinetiQ**

**Imperial College  
London**

**The Composites Centre**  
for research, modelling, testing and training in advanced composites

Enquiries: Mrs Christine Giles Tel +44 (0)1252 397478 Fax +44 (0)1252 394006

# Application form

## NON-DESTRUCTIVE EVALUATION OF COMPOSITE MATERIALS

14, 15, 16 November 2006

Please reserve one place on this course:

### Delegate's details:

Title (Mr/Mrs/Ms/Dr).....Name.....

Company/Organisation.....

Address.....

.....Postcode.....

Telephone.....Fax.....

Email .....

Applicant's signature.....Nationality.....

*Either* I enclose the fee of £1095 + VAT  
Cheques should be made payable to QinetiQ. Overseas delegates are requested to pay by sterling bank draft drawn on a UK bank

*Or* Please invoice the following person for

Name..... Order Ref No .....

Position .....

Address.....

Please tick the box if you are interested in attending the Friday workshop to finish at 12.00 noon

### Accommodation

Please indicate here if you want the organisers to send you a list of local hotels. The organisers are unable to book hotel accommodation for you

### Special requirements

Please indicate if you have any special requirements, e.g. disablement facilities, dietary, etc., and give details.

**Send completed form to:** Mrs Christine Giles,  
Room 2008, A7 Building, QinetiQ Cody  
Technology Park, Ively Road, Farnborough  
Hampshire, GU14 0LX.  
Fax +44 (0)1252 394006

# Outline Programme

## Tuesday

*Registration*

*Welcome*

Composite Materials - Strengths and Weaknesses – *Prof. Paul Curtis*

*Coffee*

An Introduction to Ultrasonic Inspection of Composites - *Mr Robert Smith*

Ultrasonic NDE for Production Inspection - *Mr Lyn Jones*

Ultrasonic NDE for In-Service Inspection - *Mr Robert Smith*

Advanced Ultrasonic Methods for Composite Inspection - *Mr Robert Smith*

*Lunch*

*Practical sessions 1 to 4:*

1 Production Scanning Systems

2 Portable Scanning Systems (I)

3 Portable Systems (II) and Multi-elements

4 Full Waveform Capture

## Wednesday

The Applicability of Radiography to the Inspection of Composites - *Dr E Anne Birt*

Low Frequency Vibration Methods for NDT of Composites - *Prof. Peter Cawley*

*Coffee*

Acoustic Emission and Acousto-ultrasonics - *Prof. Chris Scruby*

*Lunch*

Rapid Scanning Techniques - *Prof. Peter Cawley*

*Practical sessions 5 to 10:*

5 Acoustic Emission/Hammer

6 Film Radiography

7 Digital Radiography and CT

8 Woodpecker and Resonance

9 Low Frequency Vibration Methods

10 Shearography

## Thursday

Microwave NDE of Composites – *Speaker to be confirmed*

Thermographic and Optical Inspection of Polymer Composites – *Dr David Bruce*

*Coffee*

Tour of Composites Laboratory

*Lunch*

Manufacturers' Demonstrations

*Tea*

Free Demonstration Session

*End of Course 4.30pm*

## Friday

An optional workshop where delegates are encouraged to bring problem specimens for discussion. Please indicate your interest on the application form.

## Manufacturers

The following companies are expected to demonstrate NDE equipment: (any other manufacturers who wish to attend should contact Mrs Christine Giles 01252 394006)

Advanced NDT Instruments

LOT Oriel Ltd

AEGLETE

NDT Solutions Ltd

Diagnostic Sonar Ltd

Physical Acoustics Ltd

Flir Systems

Qados

GE Inspection Technologies

Staveley NDT Technologies Ltd

Holroyd Instruments Ltd

X-Tek Ltd

## **Disclaimer**

The organisers reserve the right to amend the sequence of lecture topics and to cancel lectures if necessitated due to circumstances beyond their control.

## **Queries**

Further information on the technical content of the course can be obtained from: Robert Smith, QinetiQ, Cody Technology Park, Farnborough, GU14 OLX Tel +44 (0) 1252 395655, E-mail: rasmith@qinetiq.com

## **Venue**

The course is held at the headquarters of QinetiQ in Farnborough, Hampshire. Full details of the venue will be given to delegates with their joining instructions, which are sent to all delegates 10-14 days before the course begins.

By road the QinetiQ site is 2 miles from Junction 4A, M3. Farnborough Main station is served by fast trains from London (Waterloo): a service to Gatwick Airport is available from North Camp station.

## **QinetiQ**

QinetiQ is one of Europe's largest science and technology organisations with about 9,000 staff and an annual turnover of around £800 million. The QinetiQ NDE and Composites groups pioneered the development of carbon-fibre composites and their inspection in the 1960s and 1970s, and continue to play a major part in the development of novel manufacture and inspection methods. Their laboratories will be used during the course to provide hands-on experience of the NDE of composite materials.

## **The Composites Centre, Imperial College London**

The Composites Centre, formerly the Centre for Composite Materials, was established in October 1983 and is based on expertise from eight departments within Imperial College. The Centre has three major objectives: to carry out fundamental research, to provide a service to industry and to educate and train young engineers and scientists in composites related topics. One means chosen for offering training is via short courses, which are run regularly by staff associated with the Centre, often in conjunction with other organisations or experts from outside the College.

## **Fees**

The full fee covers tuition and entitles participants to a full set of course notes, three lunches, and light refreshments. The fees do not cover accommodation: the organisers can provide a list of local hotels.

## **Cancellations**

Participants who cancel a booking three or more weeks before the course is due to commence will have their fees repaid, less a processing charge of £50. For cancellations between three weeks and one week before the course start date, only half the fee will be refunded. For cancellations in the final week, or failure to report to the course, the fee will be forfeited.

If, for any reason, fees are not paid before the course starts, but participants cancel their booking within three weeks of the course start date, action will normally be taken to obtain from participants - or their employer - that proportion of the fee owing at the time of cancellation. QinetiQ reserves the right to cancel a course if there are insufficient bookings. If a course is cancelled, fees will be refunded in full. QinetiQ also reserves the right to postpone or make such alterations to the content of the course or the speakers as may be necessary.