# Workshop on Experimental Mechanics

**Monday 18 March to Friday 22 March 2013**

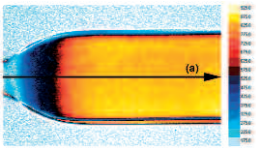
**Venue: University of Southampton, UK.**

BSSM
BRITISH SOCIETY FOR STRAIN MEASUREMENT

UNIVERSITY OF Southampton

**Chair: Professor Janice Barton**

'Experimental mechanics' can be defined as the investigation by experimental means of the mechanical behaviour of engineering systems subjected to load. The system can be a structure, a material, soft matter such as human tissue, a fluid-structure coupling; the list is practically endless. Implicit in the definition is that some kind of measurement system is used to capture a quantity that describes the system's behaviour. The main attributes conventionally associated with experimental mechanics are the deformation and the mechanical strain. These can then be related to a failure parameter by deriving the stresses from the strains by knowing the material constitutive relationships. Experimental mechanics approaches that provide a measure related to the strain are therefore very important design tools. Many of these techniques have been available for decades but recently have been gaining popularity because of the advances in computing power and decreasing hardware costs. More importantly from the design perspective, the necessity for experimental data to validate numerical models of systems manufactured from complex nonlinear inhomogeneous materials, such as fibre reinforced polymer composites, is ever increasing. Experimental mechanics approaches have much to offer and it is the purpose of this workshop to provide an overview of the range of application and operation of the techniques.




**The aims of this workshop are to:**

- **Provide an in-depth understanding of experimental mechanics approaches**
- **Introduce participants to testing procedures**
- **Provide detailed knowledge of the application of point measurement techniques such as electrical resistance strain gauges**
- **Provide a detailed knowledge of modern full field techniques such as Thermoelastic Stress Analysis (TSA), Digital Image Correlation (DIC), and Grid Methods**
- **Understand how the data from experimental techniques are manipulated to validate numerical models**

NPL National Physical Laboratory
FLIR SYSTEMS
INSTRON
LAVISION We count on Photons
VISHAY

This workshop is aimed at postgraduate students conducting research in experimental mechanics, practitioners wishing to update skills and research scientists requiring a broad overview of the topic.

The participants are expected to have a basic knowledge in mechanics. The course is aimed specifically at PhD students, but the course is also recommended for industrial engineers and scientists. Participants from industry may be exempted from the assignments and the course evaluation.

Diplomas will be issued on the basis of course participation and evaluation of post course assignments, and entitle PhD students to 5 ECTS, corresponding to 150 hours of work load.

## Workshop lecturers

Professor Janice Barton, *University of Southampton*

Professor Fabrice Pierron, *University of Southampton*

Dr Simon Quinn, *University of Southampton*

Dr Duncan Crump, *University of Southampton*

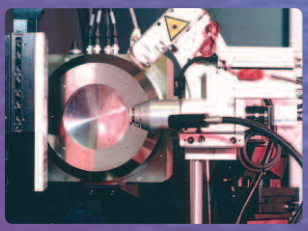
Dr Andrew Robinson, *University of Southampton*

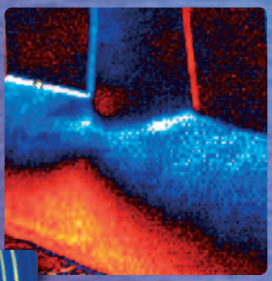
Dr Jerry Lord, *NPL*

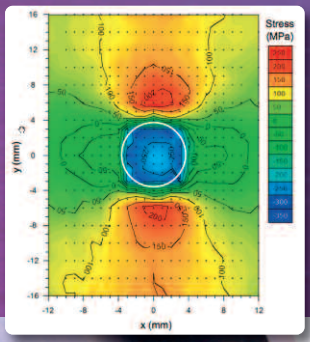
Dr Dave Hollis, *LA Vision*

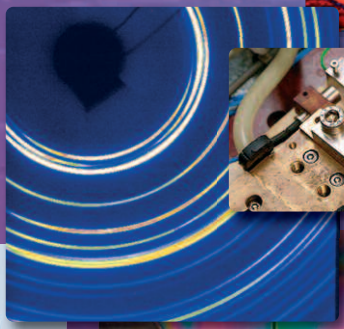
Mr Anton Chittey, *Vishay*

Mr Peter Fuller, *Instron*







# Workshop timetable

**Registration will take place in Building 7, Room 3027**
**Breaks: Morning 11.00-11.30 Lunch: 13.00 to 14.00 Afternoon 15.30-16.00**

## Monday 18 March - Mechanical Testing Procedures

| | |
|---|---|
| **09.00** | Lecture 1: Registration and Overview |
| **10.00** | Lecture 2: Test Machine Principles |
| **11.30** | Lecture 3: Strain Gauges |
| **14.00 - 18.00** | Laboratory Sessions on Strain Gauges and Mechanical Testing |

*Speakers - Barton, Quinn, Fuller, Chittey, Crump, Robinson*

***It is essential for all delegates to arrive promptly at 09.00 so that their University ID can be generated to provide access to computers and laboratories.***

## Tuesday 19 March - Digital Image Correlation and other White Light Techniques

| | |
|---|---|
| **09.00** | Lecture 4: White Light Imaging |
| **11.30** | Lecture 5: Digital Image Correlation |
| **14.00** | Lecture 6: Grid Techniques |
| **16.00 - 18.00** | Laboratory Sessions on Camera Set-up and Digital Image Correlation |

*Speakers - Barton, Pierron, Hollis, Quinn, Crump, Robinson*

## Wednesday 20 March - White Light Data Analysis and Processing

| | |
|---|---|
| **09.00** | Lecture 7: Data Analysis and Filtering |
| **11.30** | Practical Session on DIC Processing |
| **14.00** | Lecture 8: Virtual Fields Method |
| **16.00 - 18.00** | Practical Session on Data Processing |

*Speakers - Pierron, Hollis, Crump, Robinson*

## Thursday 21 March - Infra-red Techniques and Interferometry

| | |
|---|---|
| **09.00** | Lecture 9: Infra-red Imaging |
| **10.00** | Lecture 10: Thermoelastic Stress Analysis |
| **11.30** | Lecture 11: Electronic Speckle Pattern Interferometry |
| **14.00 - 18.00** | Laboratory Sessions on Infra-red and ESPI Techniques |

*Speakers - Barton, Pierron, Quinn, Crump, Robinson*

## Friday 22 March - Closing Sessions

| | |
|---|---|
| **09.00** | Lecture 12: Photoelasticity and other Optical Techniques |
| **10.00** | Lecture 13: Industrial Applications |
| **11.30** | Practical Session on Infra-red Data Processing |
| **13.00** | Wrap-up and Close |

*Speakers - Barton, Lord, Quinn, Crump, Robinson*

**Schedule is for guidance only**

## Venue information

The University of Southampton is located on the South Coast of England and is one of the top 10 research universities in the UK achieving consistently high scores for its teaching and learning activities. There are currently nearly 20,000 students and 5,000 staff based across several campuses in Southampton and Winchester. The discipline base is broad, encompassing all the major academic subjects, but there is also a unique commitment to innovation, which is evidenced both in research and scholarship at the leading edge, and also in pioneering new approaches and techniques.
The workshop will take place at the main Highfield campus and is hosted by the Faculty of Engineering and the Environment (FEE). FEE has extensive laboratory and experimental facilities.

Staff work at the forefront of their disciplines. It has strong links across the University and, because of its diverse nature, is able to offer a multi-disciplinary approach to all its research and teaching activities as well as its interactions with industry.

Southampton has its own international airport, so the city is within easy reach of Europe, with good connections to cross-channel ferries and the Eurostar rail service. The city has regular train connections from all main UK centres and is also easily accessible via road. Southampton is within easy reach of London by train and coach. For further details about how to get to Southampton and the University please visit the University of Southampton web site.

***www.southampton.ac.uk/about/whereissoton/index.html***

## Booking information

***The workshop has limited spaces and places will be allocated on registration.***

Please complete, photocopy and return to:
BSSM, PO Box 839, Flitwick, Bedford, MK45 9DU
Tel: 0845 166 8382 or from overseas +44 (0)1525 712779 email: info@bssm.org

*Name:*

*Institution:*

*Address:*

*Postcode:*

*Tel:* *e-mail:*

### Fees (plus VAT)

EU (including UK) Students £250 ☐ Non-EU Students £650 ☐

*Student rate only available for full participation.*

Industrial delegates £950 ☐ Industrial delegates (members of BSSM) £880 ☐

I wish to attend Day 1 £300 ☐ Days 2 and 3 £600 ☐ Day 4 £300 ☐

If you are a registered PhD student and wish to transfer the 5 ELTS credits to your institution please check this box ☐

### Payment by cheque, credit/debit card (not AMEX) or invoice

Please make cheques payable to British Society for Strain Measurement;
for payments by invoice please quote a purchase order reference number.

Please invoice: ☐ Purchase order reference: ☐

Card No: ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐

Start date: ☐☐ / ☐☐ Expiry date: ☐☐ / ☐☐ Issue No. (Switch/Maestro only): ☐☐

Security code *(last three digits on back of card)*: ☐☐☐