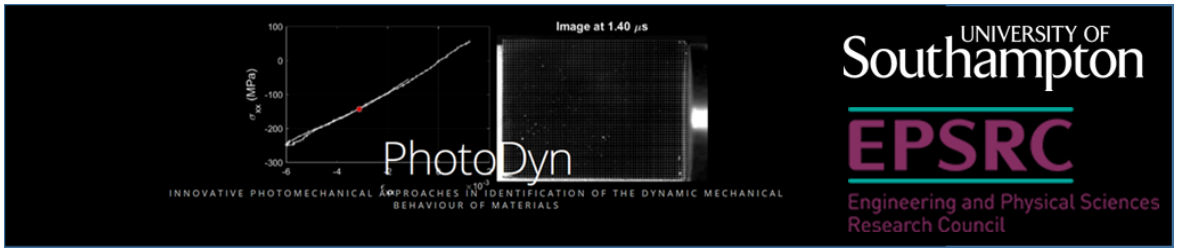


The Virtual Fields Method
with focus on transient dynamics

3-4 September 2018, University of Southampton, UK
Organized by: Prof. Fabrice Pierron and the PhotoDyn Research Group

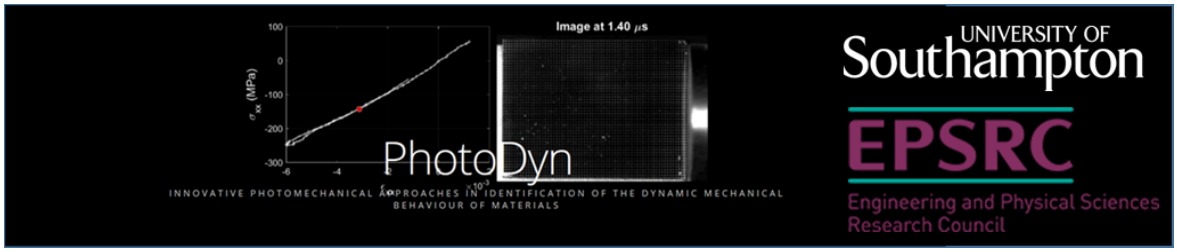
COURSE DESCRIPTION
Full-field measurement techniques are gradually becoming routine procedures in industrial and academic mechanical testing labs thanks to the wide range of commercially available systems. Having access to the spatial distribution of strains at the surface of the material (or sometimes in the bulk, as in Digital Volume Correlation from X-ray tomography or OCT reconstructed volumes) enables the use of more complex test configurations to identify the mechanical behavior of materials, with the potential of tackling difficult problems like heterogeneous materials (welds, locally damaged composites, multi-materials, functionally graded materials etc…) or complex constitutive equations (viscoplasticity at high strain rate, hyperelasticity, phase changes as in SMAs etc…). However, in this case, the data processing is not straightforward and inverse problem resolution is usually required.

The present course will introduce the participants to a tool specifically developed to solve the above problem, the so-called Virtual Fields Method (VFM). This method is an alternative to Finite Element Model Updating over which it has a number of specific advantages, among which much shorter computation times. The idea of the course is to start from scratch on the subject and gradually lead the participants to an understanding of the basic concept of the method through simple examples in linear elasticity. The VFM will then be explored in more depth to demonstrate how it can be applied to non-linear constitutive laws, heterogeneous materials etc. The important issue of virtual fields selection will also be briefly addressed.

The course will then focus on applications in transient dynamics, with a view to high strain rate testing of materials. Hands-on data processing session will show the participants how to implement the method in practice, using either Matlab or MS Excel. Laboratory demonstrations will also be organized, showing how data can be acquired from impact loading using a gas gun as well as ultrasonic excitation.

WHO SHOULD ATTEND
Engineers and researchers who have an interest in the use of full-field strain measurements to extract mechanical properties of materials. Although inverse problems are usually considered to be mathematically demanding, this course will focus on rather simple concepts that will not require any specific mathematical background. Basic solid mechanics training (graduate level) is enough to benefit from the course.
Pre-knowledge of Matlab is essential, though data processing can also be performed using MS Excel.

COURSE HANDOUTS
The participants will be provided with a USB stick containing the slides used for the presentations, the data for the exercises and a set of scientific papers relevant to the subject.



COURSE INSTRUCTORS:
Professor Fabrice Pierron and the PhotoDyn Research Group: Dr Frances Davis, Dr Lloyd Fletcher, Dr Xavier Régal, Mr Jared Van Blitterswyk, Mr Aleksander Marek
http://photodyn.org/sponsors/southampton-group

COURSE SCHEDULE (tentative)

DAY 1 – Monday 3rd September 2018

09.00	Introduction on identification of material properties
09.30	Introduction to the Principle of Virtual Work (PVW)
10.30	Coffee break
11.00	The Virtual Fields Method (VFM): principle in elasticity
12.30	Lunch
13.15	The VFM in dynamics
14.45	Coffee break
15.00	Data processing session 1: static linear elasticity Lab demo 1: inertial impact
17.00	End of the day
19.00	Dinner (venue TBC)

DAY 2 – Tuesday 4th September 2018

09.00	High speed imaging
09.45	Data processing session 2: dynamic linear elasticity Lab demo 2: ultrasonic excitation
11.00	Coffee break
11.30	Data processing session 2: dynamic linear elasticity
12.30	Lunch
13.15	Complements on the VFM • Non-linear VFM • Heterogeneous materials • Virtual Fields selection
14.45	Coffee break
15.45	High strain rate testing with VFM: examples
16.30	MatchID demo
17.00	End of the day

INFORMAL REGISTRATION OF INTEREST
If you are interested, please contact Prof. Fabrice Pierron (f.pierron@soton.ac.uk). Registration conditions and details will be released in January 2018.

SPONSORED BY

MatchID Metrology beyond colors
Image Correlation & Material Identification