ABOUT THE COURSE

Blast

The syllabus will include: Characterisation of the blast wave, modelling of blast loading, both internal and external, Characterisation of the material performance at high loading rates, Looking at the structural response of typical engineering structures and the damage mechanisms involved, Investigation of alternative structural arrangements to be more damage tolerant, Prediction of pressures generated in area surrounding blast zone and subsequent damage to people and equipments, Modelling using both deterministic and probabilistic methods, Development of simplified design criteria.

Fire

This syllabus also includes Structural Response under Fire. Basics of fire physics and the engineering idealisations made to characterise fire induced "loading" on structural systems. Detailed description of the key features of behaviour of common engineering materials (primarily steel and concrete) under high temperatures and the key responses expected when simple structural systems are exposed to fire. Traditional methods of design to ensure adequate fire resistance and recent trends towards performance based engineering in a probabilistic framework.

On completion of the course you will be able to apply a sound knowledge of various technologies for checking response of structures under fire and blast loading.

WHO SHOULD ATTEND

The course is intended for Engineers, Operations' managers, Applied Scientists and Technologists interested in design & structure under blast loading. Engineers, managers and scientists involved in design, assessment and management of a wide range of engineering structures will also benefit from this course.

COST

The registration fee of the workshop will be £750 + VAT (UK only) which includes course notes and lunches. You should make your own arrangements for accommodation.

PAYMENT

Payments can be made by cheque (made payable to ASRANet Ltd.), cash or bank transfer. Please enquire for details.

VENUE

Dublin (exact TBC)

NOTE

Please do not make your travel arrangements until you receive an Invoice from us.

CONTACT

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Engineering Structures Under Fire & Blast

26-27 March 2018
Dublin, UK

An ISO 9001:2015 certified company

PROGRAMME

Monday 26th March 2017

09.00 – 10.30	Lecture 1: Characterisation of blast effects & material dynamic behaviour *Professor Yong Lu*
10.30 - 10.45	*Break*
10.45 - 12.15	Lecture 2: Analysis of blast response of structures; simplified methods *Professor Yong Lu*
12.15 - 13.30	*Lunch*
13.30 - 15.00	Lecture 3: Analysis of blast response of structures: (nonlinear) modelling and numerical simulation *Professor Yong Lu*
15.00 – 15.30	*Break*
15.30 - 17.00	Lecture 4: Designing against blast *Professor Yong Lu*

Tuesday 27th March 2017

9.00 - 10.30	Lecture 5: Fundamentals of fire physics and heat transfer *Dr Adam Jan Sadowski*
10.30 - 10.45	*Break*
10.45 - 12.15	Lecture 6: Fire growth and characterization as a 'load' in EN 1991-1-2 *Dr Adam Jan Sadowski*
12.15 - 13.30	*Lunch*
13.30 - 15.00	Lecture 7: Mechanical properties of steel and concrete under elevated temperatures *Dr Adam Jan Sadowski*
15.00 - 15.30	*Break*
15.30 - 17.00	Lecture 8: Prescriptive fire design of steelwork according to EN 1993-1-2 *Dr Adam Jan Sadowski*

LECTURE CONTENT

Lecture 1: Characterisation of blast effects & material dynamic behaviour. This lecture begins with an overview of the blast effects on structures with a comparison to the general effects of other typical dynamic loads such as earthquakes, and discusses the characteristic differences. The lecture then proceeds with detailed discussion on the blast loads and the various approaches to the analysis and determination of the blast loads, from simplified empirical methods to advanced numerical simulation. This is followed by comprehensive discussion on the dynamic behaviour of materials, in particular concrete and steel, and the strain rate effects on the material properties. The last part of the lecture provides a numerical case study to demonstrate the general characteristics of the blast effects in a framed structure setting.

Lecture 2: Analysis of blast response of structures; simplified methods. calculation of the blast response of structures using simplified methods, namely single-degree-of-free (SDOF) method for the overall response predictions; analysis of element response using energy method; analysis of element response using equivalent SDOF method (both linear and nonlinear). An introduction of a more sophisticated analysis of element response using an advanced method involving Timoshenko beam and different failure mechanisms will also be given.

Lecture 3: Analysis of blast response of structures: (nonlinear) modelling and numerical simulation. This lecture deals with the analysis of the blast response using numerical simulation approach, with finite element and other advanced modelling techniques. A typical simulation using FE model under prescribed blast loading is discussed in detail. For complex problems fully coupled FE (for structure) and fluid dynamics (for blast) model may be required and this is discussed with application case studies. Special techniques to deal with breakup and fragmentation are also introduced and discussed.

Lecture 4: Designing against blast. This lecture will explore the design procedures for resisting blast, and the relevent codes will also be introduced

Lecture 5: Fundamentals of fire physics and heat transfer. This lecture provides an overview of fire science and fire safety engineering in order to set the subsequent material in its proper context. The fundamentals of heat transfer, including conduction, convection and radiation, are introduced, as an understanding of these is central to any fire safety design.

Lecture 6: Fire growth and characterization as a 'load' in EN 1991-1-2. Important stages in the growth of a fire are discussed along with methods of quantifying them, particularly when a fire reaches the stage where it becomes a significant threat to the stability of the structure. In particular, the lecture discusses the history and limitations of the 'standard' fire curve, the 'hydrocarbon' fire curve, and the 'parametric' or 'natural' fire curve in EN 1991-1-2.

Lecture 7: Mechanical properties of steel and concrete under elevated temperatures. These widespread structural materials suffer a marked degradation in their mechanical properties due to the action of a fire. The focus will be on steel, as it is particularly susceptible to thermal attack and requires carefully fire protection.

Lecture 8: Prescriptive fire design of steelwork according to EN 1993-1-2. This lecture builds on the fundamentals introduced in the three preceding lectures to give an introduction to prescriptive design for steel according to EN 1993-1-2.

LECTURER CV'S

Professor Lu is Chair of Structural Mechanics at The University of Edinburgh. He obtained his BEng from Tongji University, MSc from Southeast University, and PhD from National Technical University of Athens. He is CEng Chartered Engineer, Fellow of Institution of Civil Engineers (FICE), Fellow of American Society of Civil Engineers (FASCE), and a member of Joint ACI-ASCE Committee 447: Finite Element Analysis of Reinforced Concrete Structures; ASCE Technical Committee: Structural Identification of Constructed Systems; and ACI Committee 370: Design for Blast and Impact. He is an Associate Editor for International Journal of Protective Structures. His Specialities include Structures against shock/impact/blast loading, dynamic testing, Structural condition assessment and health monitoring, Strengthening and retrofitting, Performance and reliability of structures under seismic/dynamic loading, and Numerical modelling of concrete and cementitious composites for complex and high rate loading. He was a recipient of Prestigious Engineering Achievement Award 2004 by the Institution of Engineers Singapore, and Defence Technology Prize 2006 by the Ministry of Defence, Singapore.

Dr Sadowski is a Lecturer in Structural Engineering at Imperial College London. He holds an MEng and PhD in Structural Engineering and an MSc in Mathematics from the University of Edinburgh.

His research interests include shell structures, buckling and stability, computational mechanics, characterisation of the post-yield material properties of mild carbon steels and the modelling granular solid flows in silos.

He currently supervises a number of PhD students and a post-doc, and has published over 40 papers in international journals and conference proceedings.