REGISTRATION FORM

Name _____
(Please print)
Address _____

_____

_____

Telephone _____

Email _____

☐ I wish to register for the Course at a cost of £750 + VAT (UK Only) including course material and course lunches.

☐ I enclose a cheque for £750 + VAT

☐ Please invoice me at the above address

☐ Please send me information on local hotels

Disclaimer

All materials and information supplied during and associated with this course are intended purely for instructional purposes. Whilst every effort is taken to ensure that materials provided are accurate and suitable for training purposes, ASRANet Ltd accepts no responsibility for their accuracy or utility.

I accept the above.

Signature _____

Date _____

The completed form should be sent by **to:**
ASRANet Ltd.
5 St Vincent Place, Glasgow, G1 2DH

Cost

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

For more information on accommodation in Glasgow please visit http://peoplemakeglasgow.com/

Payment

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

Venue
George Square Ltd
St Georges Building
3rd Floor
5 St Vincent Place
Glasgow, G1 2DH

Tel: +44 (0) 141 275 4801
Fax: +44(0) 141 275 4800

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

Contact
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Structural Integrity Analysis (Fatigue & Fracture)

5-7 July 2017

(A Maritime Company for Courses, Conferences and Research)

ISO 9001:2008 certified company

Glasgow, UK

ABOUT THE COURSE

This course aims to provide a practical understanding of fatigue and fracture in components and structures and methods for assessing their structural integrity. Following a general introduction to fatigue and fracture, with examples of service failures, current and developing fatigue design and assessment methods will be described. The focus will be on joints, especially welds, the usual 'weak link' in most practical cases.
The course will go on to explain the importance of crack/flaw analysis in structural design and safety assessment and illuminate its wide range of applicability. It will give a deep understanding of the major results and criteria underpinning modern fracture mechanics, the assumptions behind them and important limitations. Attendees will gain a better understanding of material selection for fatigue and fracture resistance and learn about codified procedures for flaw evaluation.

The syllabus will include: Case studies of service fatigue and fracture failures; Fatigue of plain and notched metals; Fatigue of joints (welded and mechanical); Fatigue design methods and new developments; Significance of welding flaws and their fatigue assessment, including by fracture mechanics; Industrial applications, including offshore structures, ships and pressure vessels; Review of theory of elasticity, cleavage, stress concentration and stress intensity; Linear elastic fracture mechanics: Crack tip stress analysis, evaluation of stress intensity factor; Elasto-plastic fracture mechanics: the crack tip opening displacement, J integral; Failure assessment diagrams, crack tip constraint; micromechanics of fracture and BS 7910 flaw assessment procedure.

The course is intended for practicing engineers who work with mechanical design, mechanics and structures as well as those involved in testing and equipment fabrication. This is also useful to those engaged in ship and offshore structure design and maintenance.

WHO SHOULD ATTEND

Engineers and scientists involved in the design, operation and assessment of both onshore and offshore structures and their associated equipment. Personnel from oil companies, consultancy organisations, classification societies and certifying authorities will benefit from attending this course.

PROGRAMME

Dr. Helena Polezhayeva

Wednesday 5th July 2017

08.30- 09.00 Delegate Registration

09.00- 10.30 Lecture 1:
Introduction and S-N Curve
Dr. Helena Polezhayeva

10.30-11.00 Break

11.00-12.30 Lecture 2:
Effects of Stress Concentration and Welded Joints
Dr. Helena Polezhayeva

12.30-13.30 Lunch

13.30-15.00 Lecture 3: Fatigue Damage under Random Loads and Effect of Corrosion
Dr. Helena Polezhayeva

15.00-15.30 Break

15.30-17.00 Lecture 4:
Effect of Mean Stress, Thickness and Material Strength
Dr. Helena Polezhayeva

Thursday 6th July 2017

09.00-10.30 Lecture 5:
Rules for Fatigue design of Welded Structures
Strain-Life Criterion-based Approach Basics and Application
Dr. Helena Polezhayeva

10.30-11.00 Break

11.00-12.30 Lecture 6:
Weld Improvement Techniques

12.30-13.30 Lunch

13.30-14.45 Lecture 7:
Linear elastic fracture mechanics
Dr. Bostjan Bezensek

14.45-15.15 Break

15.15-16.30 Lecture 8:
Elastic plastic fracture mechanics
Dr. Bostjan Bezensek

Friday 7th July 2017

9.00–10.15 Lecture 9:
Mechanism of fracture in actual material
Dr. Bostjan Bezensek

10.15-10.45 Break

10.45- 12.00 Lecture 10:
Fracture mechanics concepts for crack growth
Dr. Bostjan Bezensek

12.00-13.00 Lunch

13.00-14.30 Lecture 11:
Engineering critical assessment
Dr. Bostjan Bezensek

14.30-15.00 Break

15.00-16.00 Lecture 12:
Practical application of fracture mechanics
Dr. Bostjan Bezensek

16.00 Closure

ABOUT THE LECTURERS:

Dr. Helena Polezhayeva

Dr Helena has more than 30 years' experience, and is internationally recognised as a fatigue expert, specialising in the development of spectral fatigue analysis and fatigue assessment procedures for a wide variety of ship types and offshore structures.

Helena also has expertise in fatigue related consultancy and research including fatigue testing and numerical analysis as well as the development and delivery of fatigue training. Helena was awarded a Royal Society Fellowship in 1994 for her Post-Doctoral research

Dr. Bostjan Bezensek, Dipl. Ing., PhD, CEng

Dr Bezensek holds an undergraduate degree in Mechanical Engineering from University of Maribor, Slovenia and a Doctor of Philosophy degree in fracture mechanics and failure assessment from University of Glasgow, Scotland, UK.

Dr Bezensek was a lecturer at the University of Glasgow, Department of Mechanical Engineering between 2005-2009 and has taught courses on materials, mechanics of solids and fracture mechanics to undergraduate students. He was then the principal engineer at Hunting Energy Services (UK) Ltd who specialises in the premium connections for the oil & gas 'upstream' industry and is now key member of the pipeline integrity group at Shell UK Ltd.

Dr Bezensek is recipient of several grants and awards from professional organisations and industry. In 2007 he was awarded the Japan Society for Promotion of Science post-doctoral grant and spent 6 months in Japan on sabbatical leave, collaborating closely with the Hitachi Research Laboratory, Hitachi Ltd on integrity of nuclear pipes with multiple flaws.

In 2009 Dr. Bezensek became Chartered Engineer and member of the ASME Boiler and Pressure vessel code Section XI working groups on Pipe flaw evaluation and on Flaw evaluation and a member of the British Standard's BS7910 committee WEE37 and sub-committee on fracture. Dr. Bezensek has been leading the effort in revising flaw interaction and combination rules in the BS 7910: 2013 edition. He also contributes to the R6 fitness-for-service code on this topic.

Dr Bezensek has been active in application of fracture mechanics to pipes and pressure vessels for over 10 years. He is an international authority on assessment of multiple flaws and regularly reviews and contributes to the international peer reviewed journals and to the ASME Pressure Vessels and Piping conference. In 2011 and 2012 Dr Bezensek was the lead organiser of the Codes & Standards track in the aforementioned ASME conference.

Lecture Content

Lecture 1: Introduction and S-N Curve

- Fatigue mechanism of materials
- Fatigue mechanism of welded structures
- Fatigue design principles
- Fatigue damage models
- Uncertainties in fatigue damage prediction
- Major factors affecting fatigue life
- Origin of SN curve & Fatigue test
- Segments of SN curve
- SN curve for welded structural details

Lecture 2: Effect of Stress Concentration

- Introduction and lessons learned from the past
- Definition of stress concentration factor (SCF)
- Methods for assessing SCF
- Stress concentration in hull structural details
- Stress concentration at welds
- Finite element modelling for SCF

Lecture 3: Fatigue Damage under Random Loads

- Linear damage accumulation law
- Fatigue damage model under random loads
- Effect of bandwidth
- Equivalent stress range

Lecture 4: Effect of Mean Stress, Thickness and Material Strength

- Simple Mean Stress Models & Strain-Life Based Models
- Mean Stress Effects in Welded Structures
- Effect of Plate Thickness on Fatigue Resistance
- Effect of Material Strength on Fatigue Resistance

Effect of Corrosion

- Mechanism of corrosion
- Impact of corrosion on fatigue resistance
- Principal aspect of coupled corrosion fatigue
- Recommendations for fatigue design
- Corrosion rate for some structural elements

Lecture 5: Rules for Fatigue design of Welded Structures

- Fatigue assessment process for hull and offshore structures
- Assessment of local stress in structural details for fatigue analysis
- Evaluation of hot-spot stress
- Secondary stress
- Design SN curve

Strain-Life Criterion-based Approach Basics and Application

- Local Strain Methodology
- Strain Life Cyclic Curves
- Strain-Life Criterion for Fatigue
- Evaluation of Local Strain
- Applications

Fatigue of Ship Structures: Application of Fracture Mechanics

- Fracture Mechanics: Basic concepts
- Fatigue crack propagation
- Stress intensity factor
- Evaluation of stress intensities
- Evaluation of (residual) fatigue life
- Fatigue Crack Propagation: Consequences

Lecture 6: Weld Improvement Techniques

- Welding Improvement Techniques
- Loading and Environmental Conditions
- Limitations

Lecture 7: Linear elastic fracture mechanics The lecture defines the fundamental concepts of stress intensity factor and crack tip plastic zone models used under small strain conditions and uses several interactive (hands-on) examples of applying the two concepts in engineering assessment (fatigue and fracture).

Lecture 8: Elastic plastic fracture mechanics the lecture defines the elastic-plastic parameters J-integral and CTOD for use with large strain assessments and introduces the crack tip constraint (T/Q) arguments.

Lecture 9: Mechanism of fracture in actual material the lecture introduces physics of fracture mechanisms in metals, from brittle fracture nucleation to ductile tearing and fatigue.

Lecture 10: Fracture mechanics concepts for crack growth the lecture focuses on fracture toughness testing to ISO 12135 (BS 7448), from test setup to post-test assessments, including pop-in events and J-R curves. Lecture concludes with the common engineering models of estimating and using fracture toughness (max load CTOD data, Charpy data, Master curve).

Lecture 11: Engineering critical assessment the lecture introduces Engineering Criticality

Assessment (ECA) and the concept of Failure Assessment Diagram (FAD) using several practical examples. Lecture continues with the key steps taken by the BS
7910:2013 assessment for fracture.

Lecture 12: Practical application of fracture mechanics the lecture presents three worked examples that are solved interactively in a workshop setting in the final 1/2 day. These include assessments of combined fatigue and fracture and fracture only problems.