Design of Lightweight Engineering Structures (Composite & Aluminium)

29-30 June 2020, Glasgow, UK

ABOUT THE COURSE

The main application for materials possessing high strength-weight ratio are in structural engineering, transport and portable appliances. Cost savings is one of the criteria for successful structural engineering and transport application. The use of strong but light-weight members helps to achieve this in that the overall stress levels in a construction are reduced together with handling, manipulation and pay-load cost. These factors are important in such applications as bridges, ships, high speed vessels, rail and transport carriers.

As light-weight applications mean the use of strong but low-density materials, alloys of aluminium are generally used. However, new approaches in fabrication techniques are leading to high use of fibre-reinforced plastics.

COST

Course fee will be ***£750 (plus VAT for UK residents)*** which includes course notes and lunches. The fee doesn't include accommodation. You should make your own arrangements for accommodation.

VENUE

George Square Ltd

St Georges Building

3rd Floor

5 St Vincent Place

Glasgow, G1 2DH

Course Outline

Monday 29th June

9:00—10:30

Lecture 1: Introduction to Composite Materials

By Dr Narasimhan Sampathkumar

Introduction: Products & Structures - Basic Definitions and Classifications – Constituent materials and types of composites – Reinforcements and Fillers

10:30—10:45 Break

10:45—12:15

Lecture 2: Fundamentals of Composite Structures

By Dr Narasimhan Sampathkumar

Mechanics of Composite Structures – Linear elastic Stress-Strain characteristics of FRP Composites – Stress-Strain concepts in 3D – Anisotropic Elasticity – Plane stress 2D elasticity concept – Theory of Laminates

12:15—13:30 Break

13:30—15:00

Lecture 3: Selection of Composite Materials

By Dr Narasimhan Sampathkumar

Selection criteria for Composite Materials Advantages and limitations of Composites – Comparison among the types of Composite materials and its applications – Manufacturing process of various Composite Structures – Testing methods – Codes & Guidelines for Design/Applications

15:00—15:30 Break

15:30—17:00

Lecture 4: Analysis & Design of Composite Structures

By Dr Narasimhan Sampathkumar

Analysis by Finite Element methods for Composite material components – Material non-linearity in Composites – Failure mechanics in Composite Structures – FEA Software programs

Design considerations: Material, Product and Manufacturing – Design of Material structure – Design for Function – Design of adhesively bonded joints – Design of Sandwich Structures

Tuesday 30th June

9:00—10:30

Lecture 5: Introduction to Aluminium Structures

By Prof Purnendu Das

Introduction to material properties of aluminium. Applications in various aspects. Different types of structural components such as stiffened plates, beam columns

10:30—10:45 Break

10:45—12:15

Lecture 6: Design for Buckling & Strength for Aluminium Structures

By Prof Purnendu Das

Behaviour and performance of aluminium structures in different loading conditions.

12:15—13:30 Break

13:30—15:00

Lecture 7: Application of Composites in Industrial Structures – I

By Dr Narasimhan Sampathkumar

Applications in Transportation systems, Civil Engineering Structures, Industrial, Aerospace and Health diagnostics

15:00—15:30 Break

15:30—17:00

Lecture 8: Application of Composites in Industrial Structures – II

By Dr Narasimhan Sampathkumar

Applications in Offshore Oil and Gas, Sub-sea structural components, Onshore/Offshore Wind turbine components and in Defence

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ABOUT THE LECTURERS

Prof Purnendu Das.

BE, ME, PhD, C.Eng, C.MarEng, FRINA, FIStructE, FIMarEST has been the Director of 'ASRANet Ltd' (an ISO 9001-2008 certified company) since February 2006. He retired as a Professor of Marine Structures in the Department of Naval Architecture & Marine Engineering at the University of Strathclyde, UK in September 2011. Past EU projects were MARSTRUCT (a network of excellence on Marine Structure) and SHIPDISMANTL (a cost effective and environmentally friendly dismantling of ship structures). Past industrial projects included work from the UK Health and Safety Executive (HSE), MoD UK, Subsea-7 UK, Shell, Woodgroup and US Navies etc. He was the principal investigator of many EPSRC projects. Before joining the University of Glasgow in 1991 he worked with British Maritime Technology as Principal Structural Engineer (1984-91). He is the author of more than 250 publications, including contract reports and more than 60 journal papers and is a member of the editorial boards of the 'Journal of Marine Structures', 'Journal of Ocean and Ship Technology' and 'Journal of Ocean and Climate System' and the Journal of Ship Mechanics amongst others. His areas of research include limit state design and analysis & reliability analysis of ship & offshore structures. Purnendu Das has wide ranging industrial and academic contacts and has advised and supervised 20 PhD students, to his credit. Details of visits and collaborations include his various sabbatical study periods spent at University of California, Berkeley, USA (July – September 1996), at Lloyd's Register of Shipping (August 1997), Kockums Ltd (July 1998) and spent some time at Instituto Superior Técnico (IST), Lisbon (July 2000). He is running about 20 CPD courses which are attracting many people from different industries. These courses are on 'Fatigue & Fracture Analysis', 'Ships at Sea', 'Advanced Analysis and Design of Offshore Structures', 'Offshore Floating System Design', 'Structural Response under Fire and Blast Loading' and 'Design of Pipelines and Risers' amongst others. He was a member of ISSC (International Ship and Offshore Structure Congress) for the periods of 1991-97 and 2003-2006. He was a member of the OMAE (Offshore Mechanics and Arctic Engineering) Organising Committee on 'Safety and Reliability'. He is running about 15 bi-annual international conferences on various themes like Risk, Reliability, Advanced Analysis & Design of Engineering Structures, including marine structures. He was a member of the "Research Committee" of Structural Engineers (IStructE) during 2012-2015. He was a visiting Professor at IST Surabaya, Indonesia from July 2015 for one year. He was a visiting professor at the Wuhan University of Technology, China from July 2016.—July 2019 &is now a visiting professor at the University of Montenegro, Montenegro.

Dr Narasimhan Sampathkumar

Dr Narasimhan Sampath Kumar, BE, MSc, PhD, C.Eng, C.MarEng, MIMarEST is currently with COWI, UK as a Principal Engineer. He is a Structural and Chartered Engineer with IMarEST with over 16+ years of experience, have been in the Wind Energy sector since 2007 initially in onshore and in offshore wind since 2012. He did his PhD at University of Southampton, Southampton in Fluid-Structures Interactions Research Group under the research topic of experimental and numerical validation of adhesively bonded joints for application to Marine structures, both to metal and composite materials. His areas of interests and experiences are within composite materials, aero-servo-hydro-elastic modelling and analysis for onshore-offshore wind turbines and foundations, advanced linear and nonlinear finite element analysis, fatigue assessment and structural integrity assessment. As a Principal Structural Engineer he has taken up various roles as Foundation structural design specialist: Conceptual, FEED & Detailed design, Technical assurance, EPCI ITT preparations / Contractor evaluations, FEA lead and as Owner's Engineer role to support Project developers for Procurement, Contractors selection, HSE and WTG-TSA. I do have a comprehensive understanding of structural analysis and design of offshore structural types for wind turbines and substations such as jackets, monopiles and gravity bases. He is an advanced user of software programs such as SESAM, ANSYS, Abaqus and familiar with the programs Bladed and FAST etc., Offshore wind experience cover range of analysis and design for integrity requirements for Ultimate, Fatigue and other limit states. These range from ILA-coupled dynamic analysis, transient, pushover, lifting, transportation and installation and for seismic situations in accordance with the codes like DNVGL, ISO, API, Eurocode, NORSOK and Noble Denton. Between 2016-2018 he was in the IMarEST Scotland committee and takes part in conducting PRI interview for IMarEST applicants.

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