

ABOUT THE COURSE

Most submarine designs are weight critical, especially as operational diving depth increases. It follows that designers will strive to select an available high strength low density material compatible with good fabricability and toughness. Toughness is required not only for the usual low temperature reasons, but also to resist high dynamic loads from depth charge attack. High strength steels have proved to be reasonably satisfactory, the main limitation being how to achieve adequate weldability and toughness for military submarines with steels above about 700N/mm² proof stress. More exotic materials would be considered for depths exceeding 1000m say. At really great depths the required pressure hull thicknesses can become so large that buckling ceases to be a problem even with low modulus materials and frames can effectively be dispensed with. In many respects the design then becomes simpler and the conventional safety factor can be reduced. This course is meant to provide comprehensive coverage of structural design and also concentrate on philosophy and underlying essentials and strength formulations for design.

WHO SHOULD ATTEND

The course is intended for Engineers, Operations managers, Fabricators, Applied Scientists and Technologists interested in submarine design.

COST

The registration fee of the workshop will be £750 + VAT (UK only)

PAYMENT

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

Contact Us

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ONLINE

Analysis & Design of Submarine Structures

17th-19th May 2021



(A Maritime Company for Courses,
Conferences and Research)

PROGRAMME (All timings are in GMT)

Monday, 17th May 2021

13.30 - 15.00 Lecture 1: Buckling shells under external pressure

Prof. Purnendu Das

15.00 - 15.30 *Break*

15.30 - 17.30 Lecture 2: Materials behavior and Fabrication Tolerance

Prof. Purnendu Das

17.30 - 18.00 *Break*

18.00 - 19.30 Lecture 3: Submarine Design- Various Failure Modes I

Prof Purnendu Das

19.30 - 20.00 *Break*

20.00 - 21.30 Lecture 4: Submarine Theory I

Prof Purnendu Das

Tuesday, 18th May 2021

13.30 - 14.30 Lecture 5: Submarine Theory II

Prof Purnendu Das

14.30 - 15.00 *Break*

15.00 - 16.30 Lecture 6: Finite Element Analysis I

Dr Derek Graham

16.30 - 17.00 *Break*

17.00 - 18.30 Lecture 7: Finite Element Analysis II

Dr Derek Graham

18.30 - 19.00 *Break*

19.00 - 20.30 Lecture 8: Design Code Examples I

Prof Purnendu Das

Wednesday, 19th May 2021

13.30 - 14.30 Lecture 9: Design Codes Examples II

Prof Purnendu Das

14.30 - 15.00 *Break*

15.00 - 16.30 Lecture 10: Fatigue Analysis

Dr Bostjan Bezensek

16.30 - 17.00 *Break*

17.00 - 18.30 Lecture 11: Fracture Mechanics

Dr Bostjan Bezensek

18.30 - 19.00 *Break*

19.00 - 20.30 Lecture 12: Structural Reliability & Application to Submarine Structures

Prof Purnendu Das

CV of Lecturers



Purnendu Das, BE, ME, PhD, C.Eng, C.MarEng, FRINA, FIStructE, FIMarEST has been the Director of 'ASRANet Ltd' 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 biennial 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. He is now a visiting professor at the University of Montenegro, Montenegro and University of Stavanger, Norway.

Derek Graham, B.Sc., Ph.D., CEng., MIMech Principal Engineer, Platform Design QinetiQ. He has worked in the field of Submarine Structures at QinetiQ and its predecessor organisations at Rosyth since 1991. He has primarily been involved in the development and application of finite element analysis methods to a range of submarine structures applications. Work on the prediction of non-linear static collapse has investigated the effects of shape imperfection, residual stresses, and material behaviour and provided validation against legacy test models. This has contributed to the design methodology of current and future submarines. He has worked on low and high frequency dynamic analysis in the context of environmental loading

including wave loading, blast and explosive loading and has worked in composite materials. Currently he is involved in developing practical analyses of important effects including the residual stresses and distortions caused by welding and weld repair, fracture and fatigue crack growth and fluid structure interactions.

Dr Bostjan Bezensek

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. He is a Chartered Engineer and member of British standard BS 7910 committees since 2008. Dr. Bezensek has over 15 years of experience in structural integrity assessments with emphasis on fatigue and fracture of corrosion and crack like defects. His early career focused on the nuclear application and he was a member of the ASME Section XI working group on pipe flaw evaluation as well as contributing to the UK's R6 programme. In recent years his focus is on the petrochemical (Oil & Gas) sector. He is the subject matter expert on the ECA (Engineering Critical Assessment) for delivery of subsea pipelines in Royal Dutch Shell group and leader in the fitness for service support to upstream and downstream asset.