ABOUT THE COURSE

This course will deal with both the loading of offshore floating structures. There will be twelve lectures in total, each of 90 minutes duration. The initial lectures will cover hydrodynamic loading and will include environmental loads and motions, buoyancy and stability, catenary and tension-leg mooring, Dynamic Positioning systems and the design of semi-submersible structures. The lectures will also cover the structural concept of floating structures in terms of function and safety. Stiff-ened plates which consist a large parts of floating structures will be dealt in detail, including structural response of stiffened plate and standards and guidelines. The structural response of stiffened shells will be dealt in detail including structural reliability. An introduction to structural reliability. Finally, the structural design of tanker conversions to FPSOs will be dealt with.

The course aims to teach the principles of design and analysis methodology of floating structures which includes semi-submersibles, sparce and tension-leg platforms. The course will teach how to calculate the hydrodynamic loading using various wave theories. From a structural point of view, the course will teach the first principle design of unstiffened and stiffened plates, structural reliability and hull girder strength of FPSOs.

WHO SHOULD ATTEND

Engineers and researchers involved in the design of offshore floating structures, Contracts engineers, Offshore installation companies, Team leaders, Conversion Engineers, Project engineers and managers, offshore controls engineers, Safety inspectors will benefits from attending this course. The course is innovative in both content & structure with a careful balance of theory & practice

COST

The registration fee of the workshop will be £850 + 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.

CONTACT

ASRANet Ltd.St Georges Building 5 St Vincent Place Glasgow, G1 2DH Scotland, UK
W www.ASRANet.co.uk/courses
E info@asranet.co.uk
T +44 (0)141 248 3040
F +44 (0)141 275 4800

Offshore Floating Structures Design

This course meets the requirement for Continuing Professional Development (CPD) of the Royal Institution of Naval Architects (RINA)

ASRANet

PROGRAMME

Day 1

08.40 - 09.00 Delegate Registration

09.00–10.30 Lecture 1: Environmental Loads

10.30 - 10.45 *Break*

10.45 - 12.15 Lecture 2: Buoyancy and Stability

12.15 - 13.30 *Lunch*

13.30 - 15.00 Lecture 3: Catenary Mooring System

15.00–15.30 *Break*

15.30 - 17.00 Lecture 4: Tension-Leg Mooring System

Day 2

09.00 – 10.30 Lecture 5: Semi-submersible Design I

10.30-10.45 *Break*

10.45-12.15 Lecture 6: Semi-submersible Design II

12.15 - 13.30 *Lunch*

13.30 - 15.00 Lecture 7: Structural Response I

15.00–15.30 *Break*

15.30 - 17.00 Lecture 8: Structural Response II

Day 3

09.00 – 10.30 Lecture 9: Structural Response III

10.30-10.45 *Break*

10.45-12.15 Lecture 10: Reliability and Safety Engineering

12.15 - 13.30 *Lunch*

13.30 - 15.00 Lecture 11: Tanker Based FPSOs

15.00–15.30 *Break*

15.30 - 17.00 Lecture 12: Tutorials on Stiffened Shells and Hull Girders

Content of the lectures:

Lecture 1: Environmental Loads
Wave load; Linear wave theory; Basic assumptions; Governing equations; Solution of linear wave; Wave energy (Potential and kinetic); Kinematics of water particles; Particles velocity and accelerations; Statistical description of sea waves; Idealised wave spectral families: JONSWAP, Bretschneider (ISSC), Pierson Moskowitish spectrums; Vortex shedding induced loads; Wave load on large bodies "Diffraction theory"; Wind loads; Current loads.

Lecture 2: Buoyancy and Stability
Flotation Principle of Archimedes; Centre of buoyancy; Static equilibrium; Sinkage, trim, combined heel and trim. Intact stability; Transverse stability; Longitudinal stability effect of free liquids and special cargoes; Curves of statical stability; Influence of hull form on ship stability; Factors affecting transverse stability; Dynamical stability. Flooding and damage stability; Damage stability calculations; Floodable length curves. Stability standards; Intact stability; Subdivision and damage stability.

Lecture 3: Catenary Mooring System
Statics of mooring lines; Heavy and short cable (catenary); Naturally buoy-ant cables; All forces considered-Mooring with elasticity; Two dimensional mass-spring system; Statics of multiple leg mooring system; Method of imaginary reaction; Load excursion static equilibrium; Cable equilibrium in three dimensional. Dynamics of mooring lines; Significance of line dynam-ics; Mooring line as continuous medium; Cable wave equation; Solution of wave equation; Mooring line as mass spring system; Equation of restoring force; Damping force-exciting force.

Lecture 4: Tension-Leg Mooring System
Dynamics of moored structure; Dynamic load and response analysis; Mo-tion characteristics; Stiffness effect on wave frequency motions; Shallow water effect; Slow drift due to wind and waves; Damping of slowly varying
Response; Transient analysis. Tension leg platforms advantage and limita-tions; Tether system design; Functional requirements; Configurations; Tether make-ups; Single tether analysis; Hydrodynamic loading; Modal analysis; Functional Requirements.

Lecture 5: Semi-submersible Design-I
Design procedure; Design Regulations; Conceptual design criterion; Gen-eral arrangements; Gravity load-Icing load; Steady environment forces; Wind, current and waves; Resistance and propulsion; Hydrodynamic forc-es; Operational loading; Wave Loading; Drag and Diffraction forces; Stabil-ity requirements; Intact, Subdivision and damage stability.

Lecture 6: Semi-submersible Design II
Seakeeping motions; Hydrodynamic response criteria; Calculation procedure of the seakeeping performance; General strength and structure design; Moor-ing system; Station keeping; Spread mooring; Method of Analysis; Environ-ment data; Wind, wave, current; Water depth; Soil and sea floor conditions; Atmospheric icing; Marine growth; Basic considerations of environmental load. Dynamic positioning; Wind forces and moment; Mean wave drift forces and moment; Capability plot of DP system.

Lecture 7: Structural Response I
Design of beam columns, elastic and in-elastic response. Johnston's formula for in-elastic columns. Perry Robertson's equation design guideline, codified rules.

Lecture 8: Structural Response II
Standards and guidelines; Stiffened plated structure Buckling & post buckling of unstiffened plates, Ultimate strength of stiffened plate, com-bined loading under axial & lateral load, Design codes API RP 2V, DNV- RPC201, Example problems.

Lecture 9: Structural Response III
Standards and guidelines; Stiffened shells; Elastic and inelastic buckling of unstiffened & stiffened shells under axial, hydrostatic & combined load-ing; Design codes API RP 2U, DNV- RP-C202; Example Problems

Lecture 11: Tanker Based FPSOs
Layout and General arrangement, Tank conversion, Longitudinal Strength characteristics, Tank design and arrangement, Design principles, Limit states, probability safety factor.

Lecture 12: Tutorials on Stiffened Shells and Hull Girders
Examples based on Elastic and inelastic buckling of unstiffened & stiff-ened shells under axial, hydrostatic & combined loading following DNV code. Examples on Hull Girder Strength will also be dealt with.