DNV

WHEN TRUST MATTERS

# TRAINING CATALOGUE

## Offshore strength assessment

**Sesam**

## Global training

Our increased focus on global training, including basic and advanced user courses, and the high level of expertise of our team of instructors, benefit users in all regions. Our training catalogue lists our many and varied technical courses and workshops spread across all brands. In addition we run customer specific courses. Many of these courses are held jointly by our own software support team and by
engineers from DNV, who bring essential expertice domain

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E-mail: software.support@dnv.com
www.dnv.com/software-training

# CONTENTS

## SESAM

# CONCEPT BASED FE MODELLING AND ANALYSIS USING SESAM – INTRODUCTORY

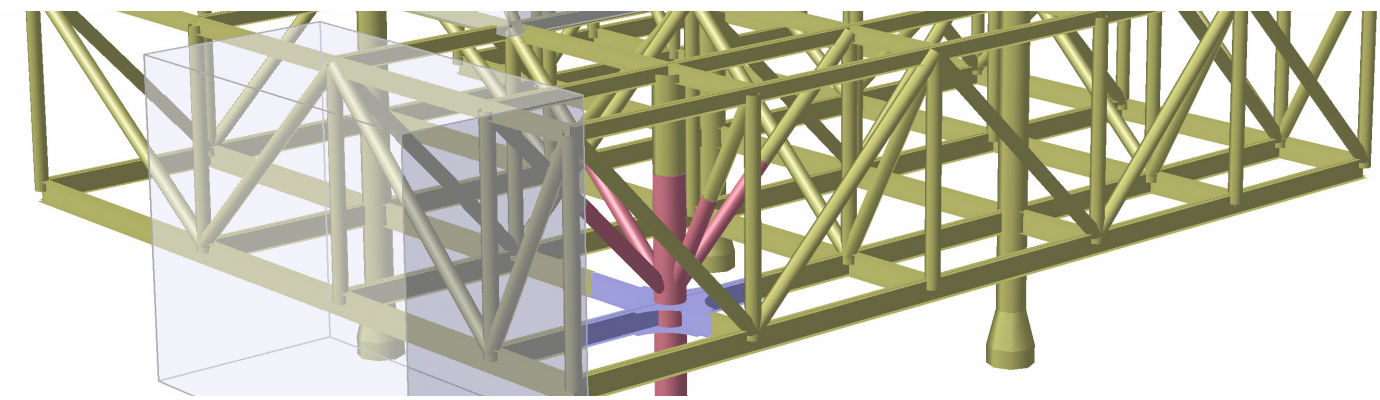
## Course code: SE-01
## Duration: 2 days

Prerequisite:
Basic knowledge in FE analysis is required. No previous experience in the use of Sesam is necessary.

**Description**
This is an introductory course to Sesam focusing on the concept modelling, structural analysis and results presentation features. Exercises in concept modelling (using the module GeniE), analysis (Sestra) and results presentations (GeniE) for a topside structure composed of beams and plates are included. Code checking (GeniE) of topside members is included.

**Learning objectives**
Learn how to use the concept modelling technique of Sesam to create finite element (FE) models, perform analysis, present results and perform member code checking.

**Target group**
Structural engineers performing design engineering of fixed and floating offshore structures built up of beams and plates.



# GEOMETRY BASED FE MODELLING AND ANALYSIS USING PATRAN-PRE – INTRODUCTORY

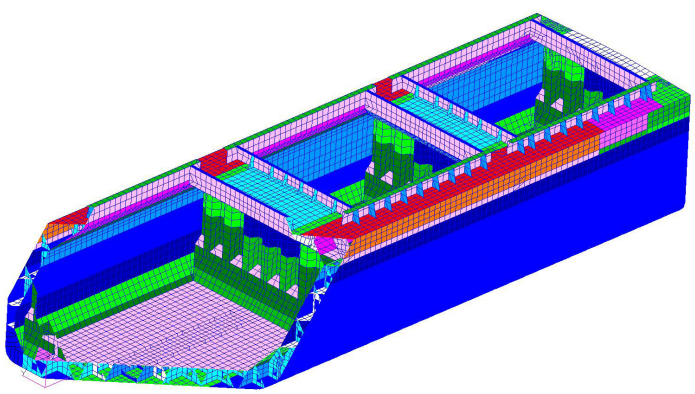
## Course code: SE-02
## Duration: 3 days

Prerequisite:
Basic knowledge in FE analysis is required. No previous experience in the use of Sesam is necessary.

**Description**
This is an introductory course to Sesam focusing on the geometry and finite element (FE) modelling features of Patran-Pre, structural analysis in Sestra and general results processing in Xtract. Exercises in modelling of a hatch coaming and a floating structure are included.

**Learning objectives**
Learn how to create FE models using Patran-Pre and analyse them using Sestra. Learn how to perform general results presentation in Xtract.

**Target group**
Structural engineers performing design engineering of fixed and floating offshore structures built up of beams, plates and shells.



# HULL MODELLING FOR HYDRODYNAMIC ANALYSIS – INTRODUCTORY

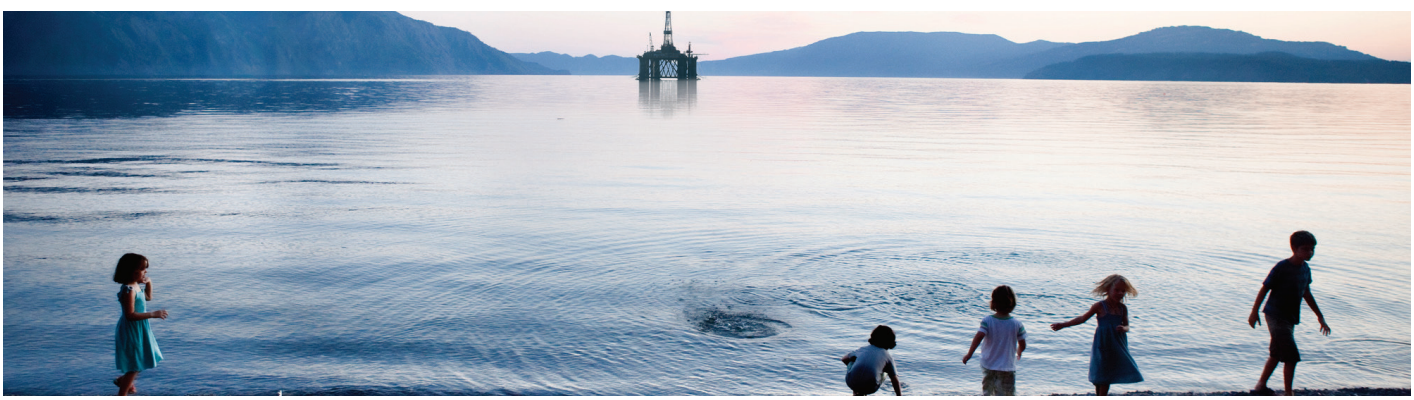
## Course code: SE-03
## Duration: 2 days

Prerequisite:
Basic knowledge in hydrostatic and hydrodynamic analysis is required. No previous experience in the use of Sesam is necessary.

**Description**
This course focuses on panel modelling of floating shell structures for the purpose of hydrostatic and hydrodynamic analysis. Mass modelling will be briefly discussed. The modelling tool will be the module GeniE. Exercises in panel modelling of a barge and a semi-submersible are included. There will also be a session on importing data from CAD.

**Learning objectives**
Learn how to create panel models for use in hydrostatic and hydrodynamic analysis in Sesam.

**Target group**
Structural engineers and naval architects involved in hydrostatic and/or hydrodynamic analysis of fixed and floating offshore structures.



# CONCEPT BASED FE MODELLING OF SHELL STRUCTURES – ADVANCED

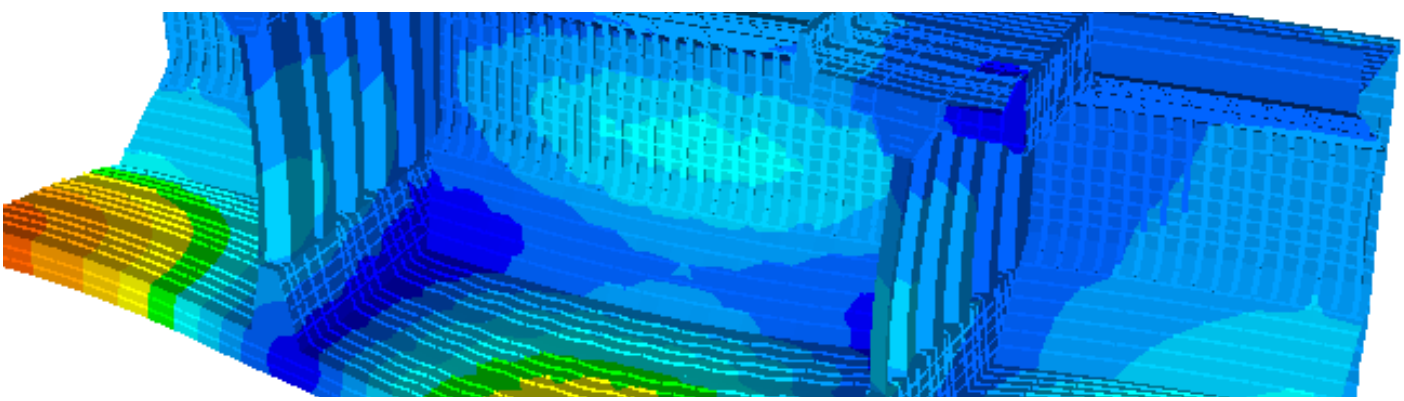
## Course code: SE-04
## Duration: 2 days

Prerequisite:
SE-01 Concept based FE modelling and analysis using Sesam - Introductory or equivalent. The participants should also be knowledgeable in the importance of FE mesh qualities.

**Description**
This course focuses on concept modelling and analysis of floating shell structures and other shell structures for the purpose of structural analysis using Sesam. GeniE is the modelling tool. Exercises in concept modelling of a tubular joint, a crane pedestal and/or a semi-submersible are included. The course also covers advanced results presentation using Xtract.

**Learning objectives**
Learn how to use the concept modelling technique of Sesam to create FE models of complex curved shell structures. Emphasis is put on how to create and tune the FE mesh. Also learn how to extract analysis results for inclusion in a report.

**Target group**
Structural engineers involved in detailed design of fixed and floating off-shore structures built up by plates/shells and stiffeners. The course is also relevant for engineers involved in FEED studies.



# HYDROSTATIC ANALYSIS OF OFFSHORE FLOATERS

## Course code: SE-05
## Duration: 1 day

Prerequisite:
It is required that the participants are familiar with hydrostatic analysis and key stability parameters. Since this course does not cover the creation of models used in hydrostatic analysis it is beneficial if the participants have knowledge of Sesam, as covered in either of the courses SE-01, SE-03 or SE-04.

**Description**
This course focuses on hydrostatic analysis and stability checking of floating structures based on relevant code check standards.

The course is based on HydroD. Exercises in hydrostatic analysis of a barge, a ship and a semi-submersible are included.

**Learning objectives**
Learn how to create different loading conditions by filling compartments, perform hydrostatic analysis, assess key decision factors and perform stability code checks.

**Target group**
Naval architects involved in conceptual studies and detailed engineering of offshore floating structures.

# HYDRODYNAMIC ANALYSIS OF OFFSHORE FLOATERS – FREQUENCY DOMAIN

## Course code: SE-06
## Duration: 2 days

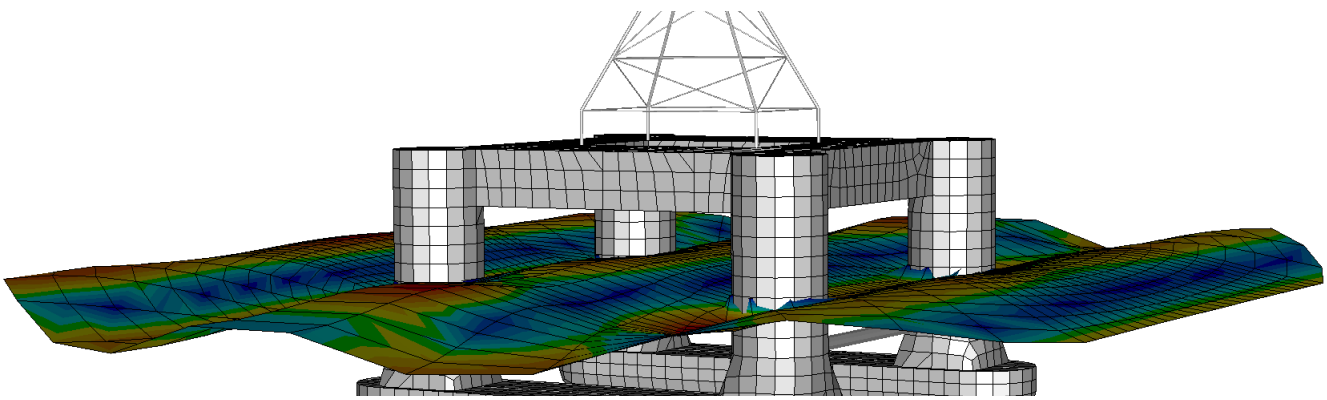
Prerequisite:
It is required that the participants are familiar with hydrodynamic analysis. Since this course does not cover the creation of models used in hydrodynamic analysis it is beneficial if the participants have knowledge of Sesam, as covered in either of the courses SE-01, SE-03 or SE-04.

**Description**
This course introduces the participants to the Sesam programs for wave load analysis of offshore floaters based on the frequency domain methodology.

The course addresses hydrodynamic analysis, short- and long-term statistics, and transfer of wave loads to structural analysis. HydroD is the main tool, supported by Wadam, Postresp and Xtract.

**Learning objectives**
Learn how to perform global hydrodynamic response analysis, transfer loads to structural analysis, compute short- and long-term statistics, and animate results. The exercise is based on a semi-submersible or FPSO.

**Target group**
Naval architects involved in conceptual studies and detailed engineering of any offshore floating structure.



# NON-LINEAR HYDRODYNAMICS ANALYSIS OF OFFSHORE FLOATERS

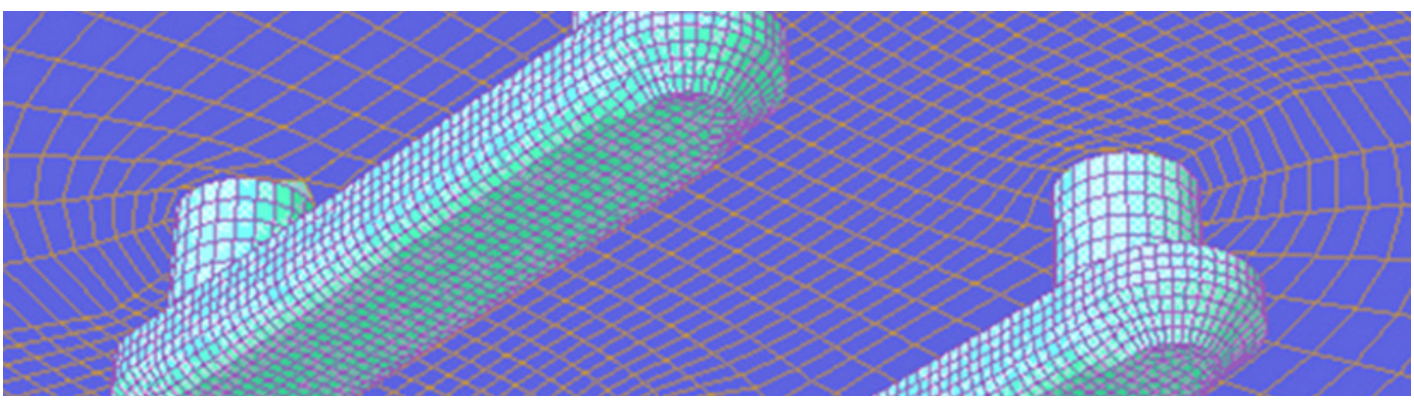
## Course code: SE-07
## Duration: 2 days

Prerequisite:
It is required that the participants are familiar with hydrodynamic analysis. In particular it is assumed that the participants are familiar with the topics covered by SE-06.

**Description**
This course introduces the participants to the Sesam programs for wave load analysis of offshore floaters based on time domain methodology. The course covers some theory description, numerical challenges in a time domain analysis, description of the non-linear effects included, various types of environmental data that can be used as input, execution and animation of the time domain simulations, and load transfer of hydrodynamic results to structural analysis. HydroD is the main tool, supported by Wasim and Xtract. You will also learn how to create panel models using Wasim.

**Learning objectives**
Learn how to perform non-linear global hydrodynamic response analysis, transfer loads to structural analysis, and animate results. The exercise is based on a semi-submersible.

**Target group**
Naval architects involved in conceptual studies and detailed engineering of any offshore floating structure.



# JACKET ANALYSIS

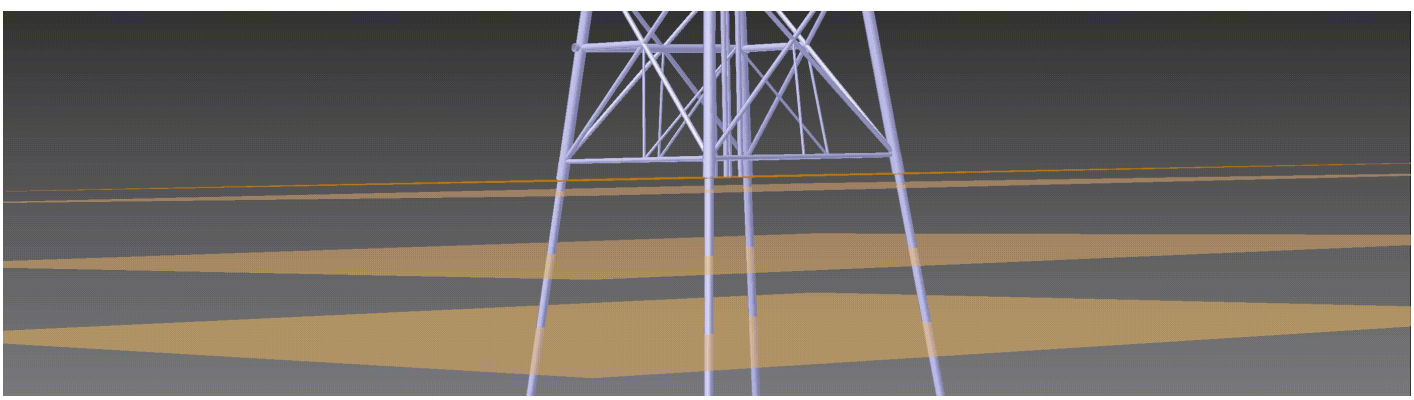
## Course code: SE-09
## Duration: 3 days

Prerequisite:
It is required that the participants have attended SE-01 Concept based FE modelling and analysis using Sesam - Introductory, or have similar experience.

**Description**
This course focuses on analysis of jackets including the environment (hydrodynamic environment and pile-soil foundation). Concept modelling of the jacket and environment is done in GeniE, wave load analysis in Wajac, non-linear pile-soil analysis in Splice, linear static analysis in Sestra and, finally, code checking of beams and tubular joints in GeniE. The course also covers re-design of members. Fatigue analysis in Framework using a deterministic, stochastic and spectral (static and dynamic) approach is presented.

**Learning objectives**
Learn how to model jackets with tubular joints, compute wave and wind loads, perform structure-pile-soil interaction analysis, code check the results (member check and punching shear check) and perform fatigue analysis. The exercise is based on a jacket structure including environment.

**Target group**
Structural engineers performing design engineering of jackets and jack-ups.



# PROGRESSIVE COLLAPSE ANALYSIS

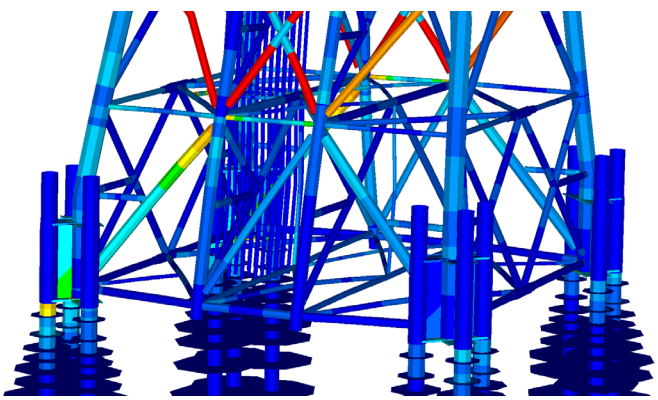
## Course code: SE-10
## Duration: 2 days

Prerequisite:
It is required that the participants have attended SE-01 and SE-09 or have similar experience. The participants should also have basic knowledge in non-linear structural analysis.

**Description**
This course covers ultimate strength and progressive collapse analysis of steel space frame structures using Usfos. Focus is put on plastic limit state analysis of jackets subjected to accidental loads (ship collision, dropped objects, fire and explosion) and extreme environmental loads (wave, wind and current).

**Learning objectives**
Learn how to import models created by GeniE into Usfos and add non-linear data necessary to perform progressive collapse analysis. You will also learn how to present and understand the results. The exercise is based on a jacket.

**Target group**
Structural engineers performing ultimate strength, accidental and life extension analysis of jackets.



# WIND INDUCED FATIGUE

## Course code: SE-11
## Duration: 1 day

Prerequisite:
It is required that the participants have attended SE-01 and preferably also SE-09 or have similar experience.

**Description**
This course covers gust wind and vortex shedding induced fatigue analysis of beam structures. The main tool is Framework. Structure modelling is performed in GeniE, and computation of static wind loads is performed in Wajac.

**Learning objectives**
Learn how to create static wind loads in GeniE and Wajac, and how to use these loads in a gust wind and vortex shedding induced fatigue analysis in Framework. The exercise is based on a flare tower.

**Target group**
Structural engineers performing wind fatigue analysis of topside structures.

# INSTALLATION ANALYSIS OF JACKETS

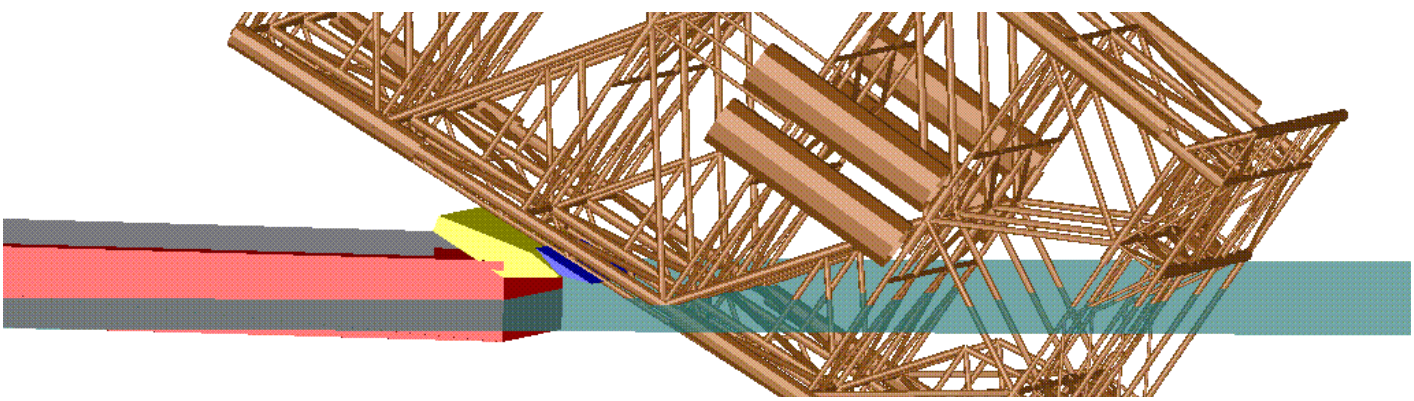
## Course code: SE-12
## Duration: 2 days

Prerequisite:
It is required that the participants have attended SE-01 or have similar experience.

**Description**
This course covers installation analysis of jacket structures. Focus is on launching and upending analysis based on Installjac. Preparation of the jacket model in GeniE, with respect to the installation analysis and subsequent structural analysis, is also addressed.

**Learning objectives**
Learn how to do launching and upending analysis and how to create loads for given time steps for use in a structural analysis. The exercise is based on a jacket launched from a barge.

**Target group**
Hydrodynamic and structural engineers assessing jacket installations.



# SEMI-SUBMERSIBLE ANALYSIS

## Course code: SE-13
## Duration: 4 days

Prerequisite:
It is required that the participants have attended SE-01 Concep based FE modelling and analysis using Sesam - Introductory, and are familiar with hydrodynamic analysis.

**Description**
This course focuses on design analysis of semi-submersibles. Modelling the structure for FE analysis and the panel model for hydrodynamic analysis is done in GeniE. The hydrodynamic environment modelling is done in HydroD and the hydrodynamic analysis in Wadam. Hydrodynamic loads are transferred to the FE model for structural analysis in Sestra. Hydrodynamic and structural results are presented in Xtract. Code checking of beams and plates is performed in GeniE. Sub-modelling using Submod, and fatigue analysis of plates/shells using Stofat, are also briefly discussed.

**Learning objectives**
You will learn to perform all basic steps of structural and hydrodynamic analysis of a semi-submersible and similar floating structures.

**Target group**
Hydrodynamic and structural engineers working with design of offshore floaters.

# HYDROSTATIC AND HYDRODYNAMIC ANALYSIS OF SHIPS

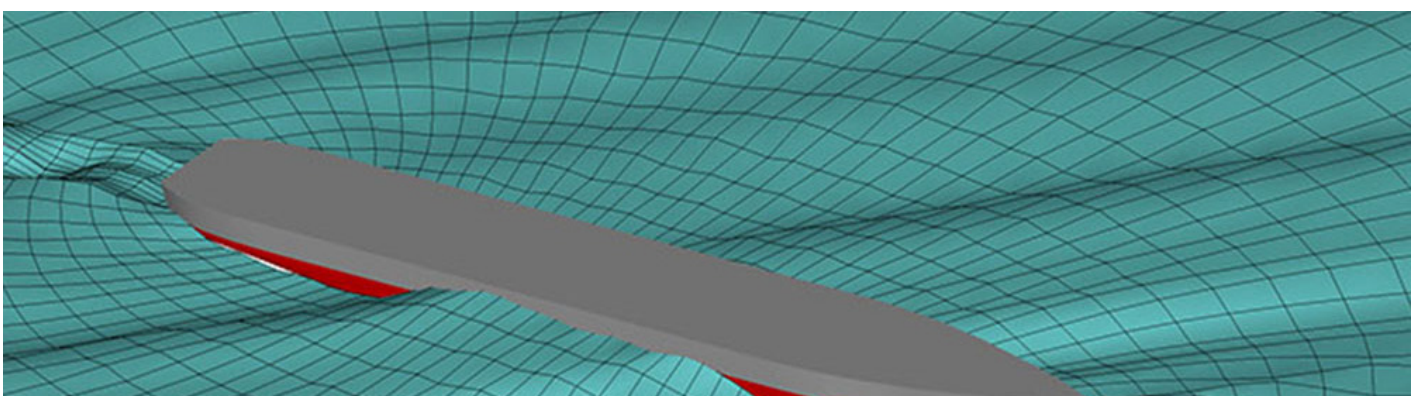
## Course code: SE-14
## Duration: 3 days

Prerequisite:
It is required that the participants are familiar with hydrodynamic analysis and free surface problems.

**Description**
This course introduces the participants to our stability and hydrodynamics tool HydroD, supported by Wasim, Postresp and Xtract. The course includes both hydrostatic and hydrodynamic analysis of ships, and statistical post-processing animation.

**Learning objectives**
Learn how to perform hydrostatic analysis of a ship. Learn how to perform a global hydrodynamic analysis and transfer loads to a structural analysis using both linear frequency domain and non-linear time domain methods. You will also learn how to do short-term statistical analysis in frequency domain and how to create animations of time domain simulations.

**Target group**
Naval architects involved in conceptual studies and/or detailed engineering of any type of ship.



# FPSO CARGO HOLD ANALYSIS

## Course code: SE-16
## Duration: 3 days

Prerequisite:
Basic understanding of ship structures and hull strength and use of FE analyses for strength calculations. Knowledge in Nauticus Hull as covered in NA-02. It is beneficial if the participants have attended SE-01.

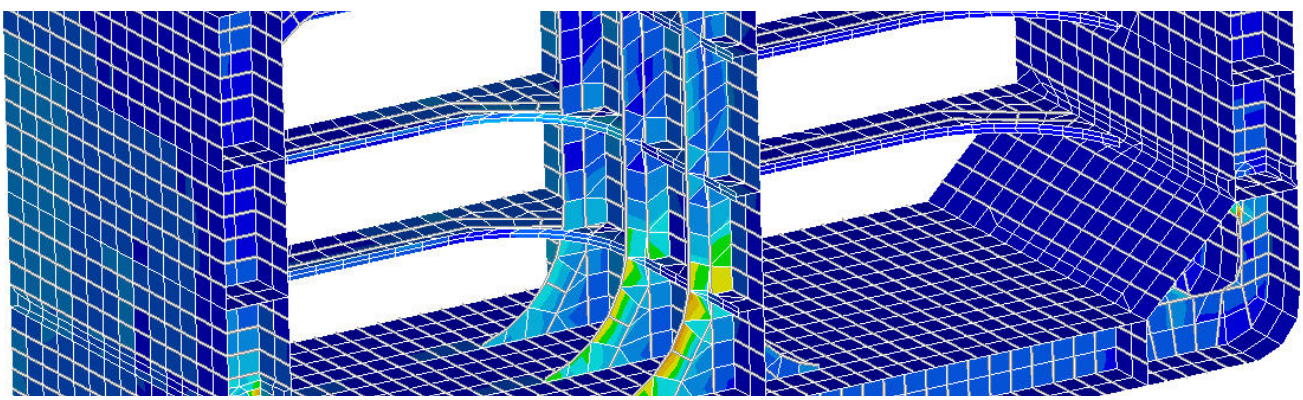
**Description**
The course is an introduction to programs for modelling and FE analyses of FPSOs according to the Offshore Standard DNVGL-OS-C102. Focus is put on extruding a cross section from section scantlings, 3D modelling and mesh control in GeniE, applying loads, corrosion additions and boundary conditions according to DNVGL-OS-C102 and DNVGL-RP-C102, running a Sestra analysis and post-processing using Xtract.

The course will be a combination of lectures and hands-on training. The hands-on example consists of building and meshing a cargo hold model, analysing it and performing stress level assessment. The cross section for the cargo hold model is extruded from a midship section modelled in section scantlings in NA-02 Nauticus Hull rule check analysis.

The course will also provide an introduction of the DNV Offshore Rules and their requirements to strength assessment analyses of the cargo hold area.

**Learning objectives**
After the course you should be able to create FPSO cargo hold models and execute FE analyses for strength and stress level assessment.

**Target group**
Structural engineers working with design of FPSOs.



# COUPLED MOTION ANALYSIS AND RISER DESIGN OF FLOATING OFFSHORE INSTALLATIONS

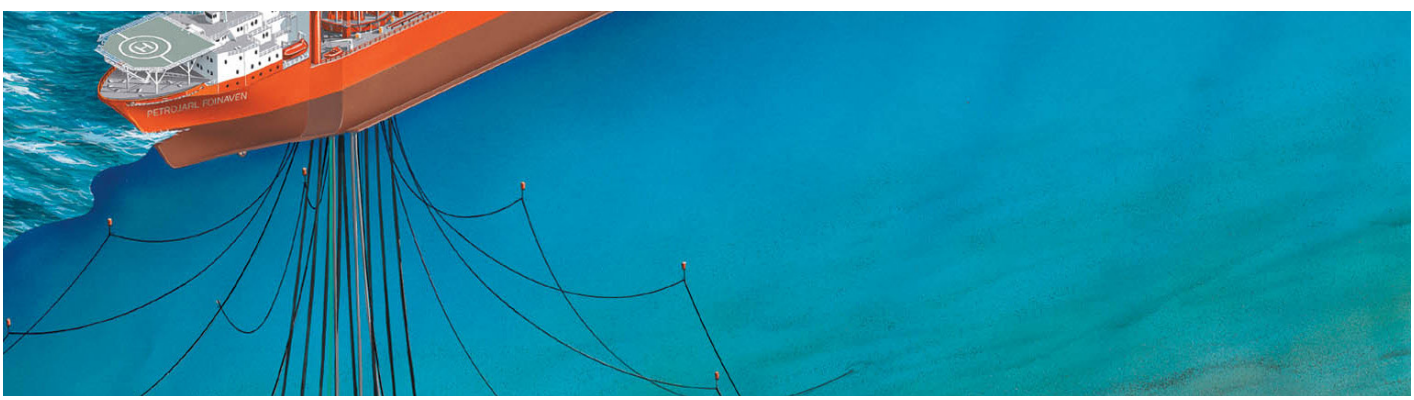
## Course code: SE-18
## Duration: 3 days

Prerequisite:
It is required that the participants are familiar with hydrodynamic analysis, riser design and non-linear analysis. No previous experience in use of Sesam is mandatory, but it is beneficial to have knowledge of Sesam's hydrodynamic tools as used in SE-06.

**Description**
The course introduces the Sesam tools for carrying out both coupled floater motion analysis and analysis of individual lines in time domain. Modelling of the slender structure, set-up and execution of the analysis, as well as post-processing the analysis results, will be covered.

**Learning objectives**
The following topics will be covered:
- Concept modelling of riser/mooring system and vessels
- Environmental load modelling
- Coupled analysis, set up and execution
- The seamless interaction with HydroD, Simo and Riflex
- Static configuration of vessel/mooring system
- Post-processing of time series results
- Fatigue analysis of lines
- ULS code checking of steel risers

**Target group**
Structural engineers/naval architects involved in design or verification of floating offshore installations and the interaction with their risers and moorings.



# RISER ANALYSIS

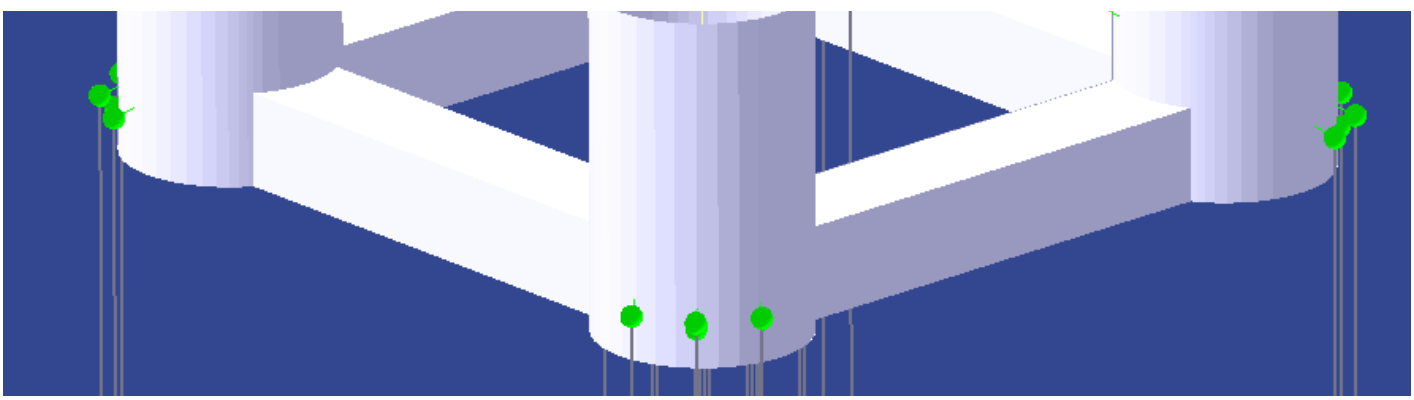
## Course code: SE-19
## Duration: 2 days

Prerequisite:
No previous experience in use of Sesam is required. However, some basic knowledge in riser design and non-linear FE analysis is required. For extension to coupled analysis of riser systems, see SE-18.

**Description**
The course introduces the Sesam tools for carrying out riser analysis in time domain without the effects from a coupled analysis.

**Learning objectives**
Learn how to analyse marine risers. The following topics will be covered:
- Concept modelling of risers
- Environmental load modelling
- Analysis of individual lines based on floater RAOs or time series from file
- Use of Riflex through DeepC
- Post-processing of time series results
- Fatigue analysis
- ULS code check of steel risers

**Target group**
Structural engineers involved in design or verification of marine risers.



# MOORING LINES ANALYSIS

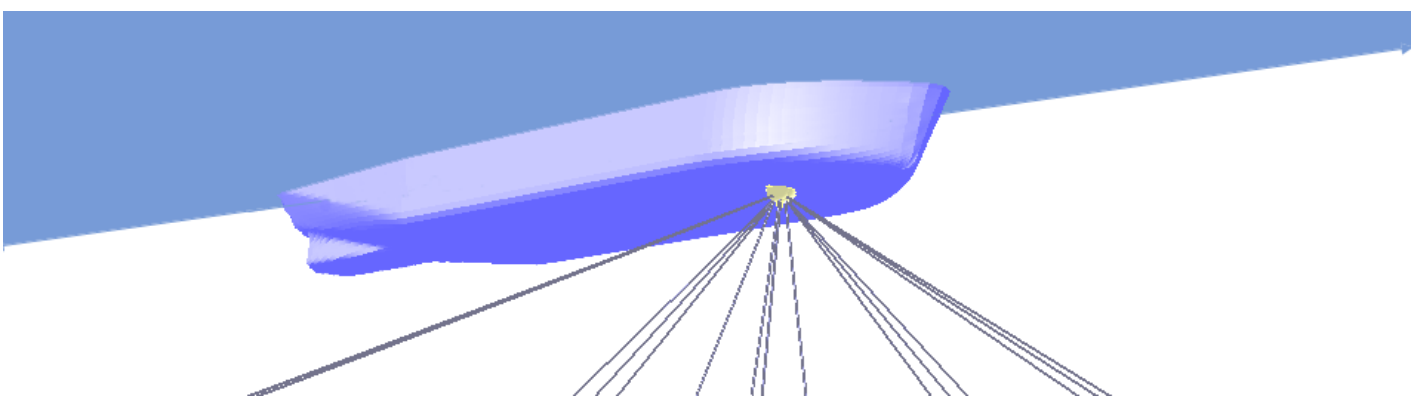
## Course code: SE-20
## Duration: 2 days

Prerequisite:
It is required that the participants are familiar with hydrodynamic analysis. No previous experience in use of Sesam is mandatory, but it is beneficial to have knowledge of Sesam's hydrodynamic tools HydroD and Wadm as used in SE-06.

**Description**
The course introduces the Mimosa tool for frequency domain analysis of mooring lines.

**Learning objectives**
Learn how to analyse mooring lines. The following topics will be covered:
- Modelling of vessel data and mooring lines
- Environmental load modelling
- Static and dynamic motion response analysis
- Transient motion analysis
- Dynamic positioning with thrusters
- Interaction with the Sesam suite of programs HydroD and Wadam
- Statistical post-processing of results

**Target group**
Naval architects/structural engineers involved in design of mooring lines.



# SIMULATION OF MARINE OPERATIONS

## Course code: SE-21
## Duration: 3 days

Prerequisite:
It is required that the participants are familiar with hydrodynamic analysis. No previous experience in use of Sesam is mandatory, but it is beneficial to have knowledge of Sesam's hydrodynamic tools, HydroD and Wadam as used in SE-06 Hydrodynamic analysis of offshore floaters - frequency domain.

**Description**
This course introduces the participants to Sesam's tools for simulation of marine operations, e.g. heavy lifting, side-by-side mooring and floatover.

**Learning objectives**
Learn how to simulate marine operations like for example deck mating, lifting of large deck structures and modules, lift installation of subsea templates and towing by using Sima as a graphical front end to Simo and Riflex.

The following topics will be covered:
- Modelling marine simulation in a visualized Sima environment
- Flexible force models for complex marine operations
- Environmental loading due to wind, waves and current
- Modelling of floating wind turbines
- Interaction with Sesam suite of programs (HydroD and Wadam)
- Post-processing of results

**Target group**
Naval architects and marine engineers involved in analysis of marine operations.

# SUB-MODELLING ANALYSIS COMBINED WITH PLATE/SHELL FATIGUE ANALYSIS

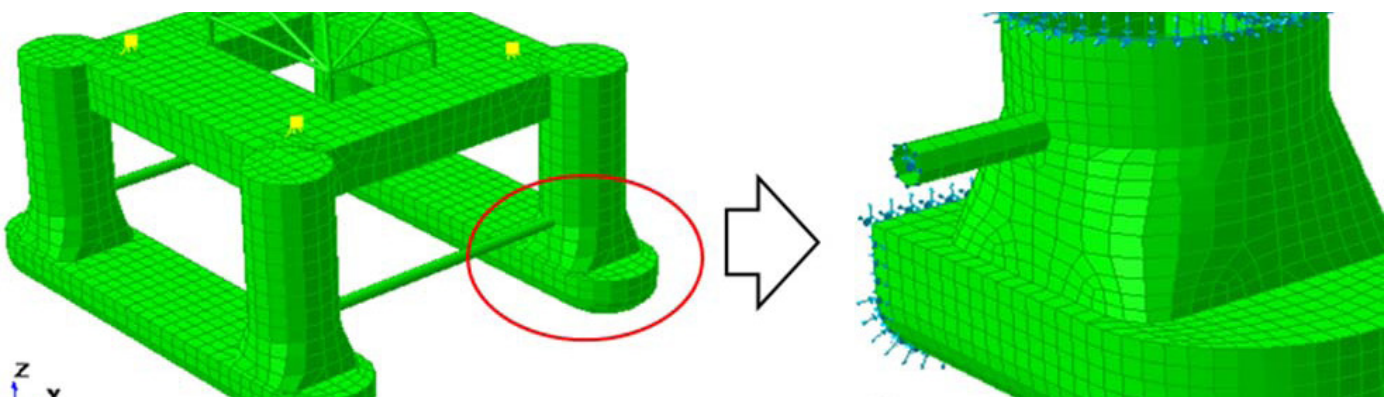
## Course code: SE-22
## Duration: 2 days

Prerequisite:
SE-01. The participants should also have knowledge of the principles of stochastic (spectral) fatigue analysis.

**Description**
The course introduces the sub-modelling technique which allows a refined analysis of a detail of the whole structure. Displacements extracted from an analysis of the whole structure are subjected to the sub-model boundaries together with local loads on the sub-model. Such local sub-model loads may be hydrodynamic loads. A sub-model analysis facilitates stochastic (spectral) fatigue analysis of a plate/shell detail.

**Learning objectives**
Learn how to create sub-models in GeniE and use Submod to perform a sub-modelling analysis. Also learn to use Stofat for stochastic fatigue analysis of plate/shell type structures.

**Target group**
Structural engineers involved in detailed design of fixed and floating offshore structures built up by plates/shells and with attention to fatigue problems.



# FPSO GLOBAL STRENGTH AND SPECTRAL FATIGUE ANALYSIS

## Course code: SE-23
## Duration: 4 days

Prerequisite:
It is required that the participants have attended SE-04 – alternatively SE-05, SE-06 or SE-16 – or have similar knowledge in use of GeniE, HydroD, Wadam and Sestra.

**Description**
The course focuses on direct hydrodynamic and strength analysis methods, global structural analysis and spectral fatigue calculations.

You will go through the process of carrying out global analysis with direct calculated loads using GeniE, HydroD, Wadam and Sestra. Ultimate strength, local analysis and stochastic fatigue calculations are covered with practical examples using Cutres, Xtract, Puls, Submod and Stofat. The course focuses on practical use of the software tools in the analysis workflow.

**Learning objectives**
You will learn how to perform all necessary steps of assessing the structural integrity of an FPSO.

**Target group**
Structural engineers working with design of FPSOs.

# ADVANCED USE OF SESAM FOR FIXED STRUCTURES

## Course code: SE-24
## Duration: 2 days

Prerequisite:
SE-01 Concept based FE modelling and analysis using Sesam - Introductory, and preferably SE-04 Concept based FE modelling of shell structures - Advanced.

**Description**
The course covers advanced use of the relevant modules for analysis of fixed structures.

Topics include:
- Scripting in GeniE
- Superelement technique: Jacket inplace analysis
- Superelement technique: Dynamic analysis
- Mesh control and rigid links
- Managing work flow using Sesam Manager
- Tension/compression only elements- transportation analysis (optional)
- Analysis with different boundary conditions
- Modelling errors in GeniE
- Model import from Rhino3d/DXF Curves (optional)

**Learning objectives**
To be agreed by the participants and DNV GL.

**Target group**
Advanced Sesam users.

# HULL FORM MODELLING IN GENIE

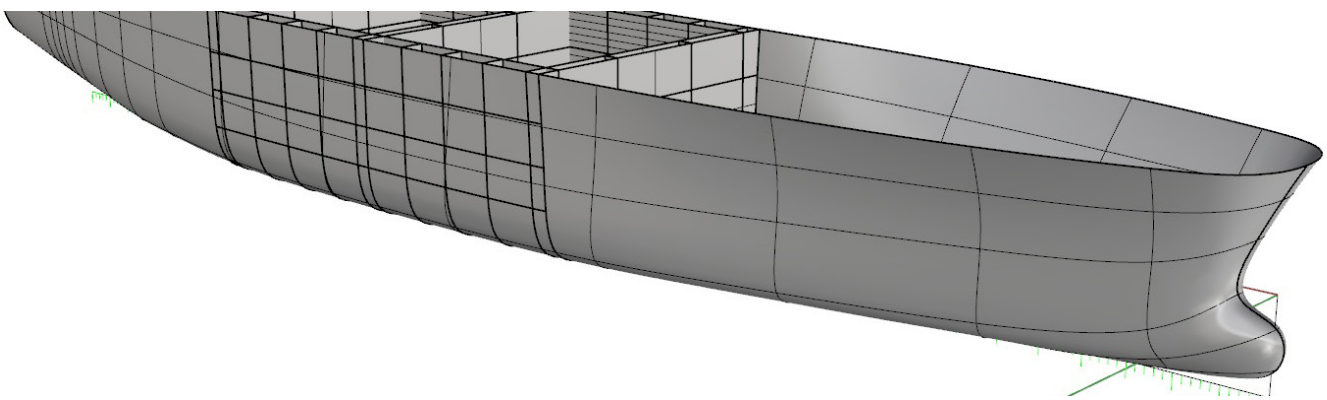
## Course code: SE-25
## Duration:
## typically 1–2 days

Prerequisite:
SE-01 Concept based FE modelling and analysis using Sesam - Introductory, and preferably SE-04 Concept based FE modelling of shell structures - Advanced.

**Description**
Guidelines for modelling and meshing typical hulls, including:
- Import surfaces from CAD and Sesam Hull Translator
- Import curves from CAD or offset tables
- Model checking
- Idealizing geometry
- Meshing
- Local models

**Learning objectives**
Learn hull form modelling in GeniE.

**Target group**
Advanced GeniE users.



# JSCRIPTING IN GENIE

## Course code: SE-26
## Duration: 1 day

Prerequisite:
SE-01 Concept based FE modelling and analysis using Sesam - Introductory and SE-04 Concept based FE modelling of shell structures - Advanced, or SE-09 Jacket analysis.

**Description**
This course will give you an overview in how to use JScript to become a more efficient user of Sesam.

Workshops and presentations in how to use JScript and how to create scripts to perform generic tasks are included.

The course material also include a small library of sample scripts for different purposes.

**Learning objectives**
You will learn how to become a more efficient user of Sesam using JScript.

**Target group**
Advanced Sesam users.

# STRUCTURAL ANALYSIS OF FIXED OFFSHORE WIND TURBINE SUPPORT STRUCTURES

## Course code: SE-27

Duration:
Option 1: 2 days (standard)
Option 2: 3 days (incl. SE-09)
Option 3: 5 days
(incl. SE-01 and SE-09)
Option 4: combined with Bladed (upon request)

Prerequisite:
It is required that the participants are familiar with modelling in GeniE, hydro-dynamic analysis and pile/soil analysis.
Previous experience of Sesam is required equivalent to SE-01 Concept based FE modelling and analysis using Sesam - Introductory ,and SE-09 Jacket analysis.

**Description**
The course focuses on structural analysis of offshore wind turbine support structures, with main focus on jacket based support structures. You will use GeniE and Splice to linearize a non-linear pile-soil foundation, perform Eigenvalue analysis and use Framework for carrying out fatigue analysis due to waves as well as due to (cyclic) damage equivalent loads. GeniE is used to perform a code check based on extreme loads. You will also use Sesam Wind Manger, to carry out fatigue and ultimate strength analyses in the time domain, using time series of wave and wind turbine loads, using a sequential/superelement analysis approach and using an integrated design approach.

**Learning objectives**
The following topics will be covered:
- Linearizing a non-linear pile-soil foundation
- Eigenvalue analysis of jacket structures
- Fatigue analysis using deterministic wave loads
- Fatigue analysis using (cyclic) damage equivalent loads
- Ultimate strength analysis using extreme loads
- Fatigue analysis using time series of wave and wind turbine loads using rainflow counting
- Ultimate strength analysis in the time domain
- Time domain analysis using a sequential, superelement and integrated analysis approach
- Conversion of a superelement and wave loads or an integrated model from Sesam to wind turbine tools, conversion of interface and/or member loads from wind turbine tools into Sesam

**Target group**
Structural engineers involved in design, analysis or verification of fixed offshore wind turbine support structures.

# SESAM FOR JACKET DESIGN – FROM CONSTRUCTION TO INSTALLATION

Course code: SE-30
Duration:
Option 1: 12 weeks – per week, one evening training + homework
Option 2: 5 days of intense training
Option 3: 10 days of training

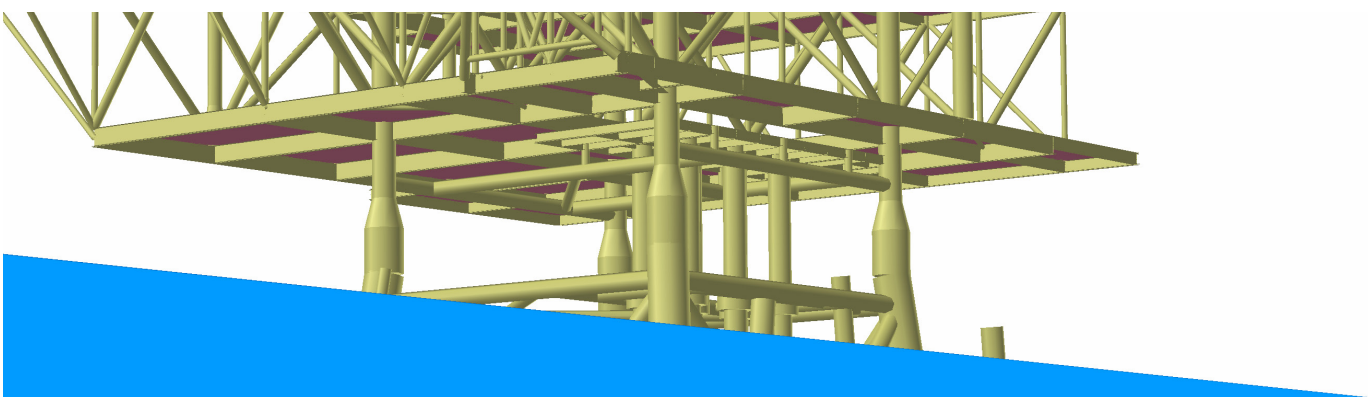
Prerequisite:
Requires basic skills in Sesam, course SE-01 or similar, and jacket design.

**Description**
This workshop is meant to guide an engineer through the various analysis tasks required for a jacket design. The workshop is built up in lectures focusing each analysis task – this means that the attendee should have basic skills in Sesam and jacket design from before. The workshop material is built up to guide users though all steps required – in addition there is a general introduction to the subject jacket design and there are more explanations on the reason behind some of the design stages.

The workshop is divided into the following sections:
- Introduction
- Defining the workflow
- Modelling structure, loads, environment, pile and soil
- Linear analysis with wave and non-linear pile/soil
- Code checking of members (jacket and topside)
- Code checking of tubular joint
- Dynamic analysis (including eigenvalue)
- Fatigue analysis (spectral)
- Load-out analysis
- Jacket transportation analysis (centripetal accelerations)
- Deck lifting analysis
- Jacket launch analysis
- Un-piled condition

**Learning objectives**
Learn how to design, model and install a jacket.

**Target group**
Structural engineers performing design engineering of jackets.



# SIMULATION-DRIVEN SHAPE OPTIMIZATION WITH CAESES – INTRODUCTORY

## Course code: SE-31
## Duration: 2 days

Prerequisite:
Good knowledge of CAE simulation is preferred as well as basic knowledge of CAD modelling. No previous experience using CAESES is required.

**Description**
The course gives you an introductory overview of the major functions and features found within CAESES. You will learn how to create parametric models which are ready to be used in the automation process. A general introduction to the software connector will be given in order to provide guidelines on how to couple CAESES with your simulation software of choice. Optimization algorithms, DoE, and post-processing will also be touched upon.

**Learning objectives**
Learn the basic principles of using CAESES for automated shape optimization studies. Typical industrial applications include reducing the resistance of your hull-form, maximizing the efficiency of your pump, lowering the pressure losses through your duct or manifold, or improving the sea-keeping behavior of your offshore platform.

**Target group**
CAE engineers who have a solid background in simulation (e.g. CFD, FEA, seakeeping) and are using these codes to drive their mechanical or hydrodynamic designs.

# SIMULATION-DRIVEN SHAPE OPTIMIZATION WITH CAESES – ADVANCED

## Course code: SE-32
## Duration: 3–5 days

Prerequisite:
Good knowledge of CAE simulation is preferred as well as basic knowledge of CAD modelling. Some experience using CAESES is required, and it is preferred that you have completed the introductory course SE-31 or that you have gone through the first two sections of tutorials.

**Description**
This course includes advanced topics relevant to your specific application. Examples include advanced meta-surface modelling (such as for ship hulls, turbomachinery blades and volutes, aerodynamic bodies, etc.), transformation of existing geometries, feature scripting, coupling to your specific CFD or CAE tools, and setting up the automation process. By the end of the course, you will have the ability to create the automatic optimization set-up for your industrial project.

**Learning objectives**
Learn how to use advanced techniques in CAESES to perform automated shape optimization studies. Typical examples include reducing the resistance of your hull-form, maximizing the efficiency of your pump, lowering the pressure losses through your duct or manifold, or improving the sea-keeping behavior of your offshore platform.

**Target group**
CAE engineers who have a solid background in simulation (e.g. CFD, FEA, seakeeping) and are using these codes to drive their mechanical or hydrodynamic designs.

# PROBABILISTIC FATIGUE ANALYSES AND INSPECTION PLANNING

## Course code: SE-33
## Duration: 2 days

Prerequisite:
SE-09 or similar knowledge of wave induced fatigue analysis is very relevant for this course, but not essential.

**Description**
This course is intended for users seeking to perform inspection planning optimizations or wave induced probabilistic fatigue analysis using either SN fatigue or a fracture mechanics approach.

**Learning objectives**
You will learn the theoretical bases behind the features available in Profast, as well as how to set up wave induced fatigue analyses and/or optimized inspection planning.

Model creation inside of Profast or import of a previous Sesam model will be dealt with in the workshops, in addition to the necessary input for the different types of analyses.

**Target group**
Users who want to perform more detailed SN fatigue analysis using reliability methods or who want to perform fatigue analysis using fracture mechanics approach.

Users who want to perform optimized inspection planning or update reliability of the structure based on inspection findings.

# ANALYSIS OF FREE SPANNING PIPELINES USING FATFREE

## Course code: SE-34
## Duration: 2 days

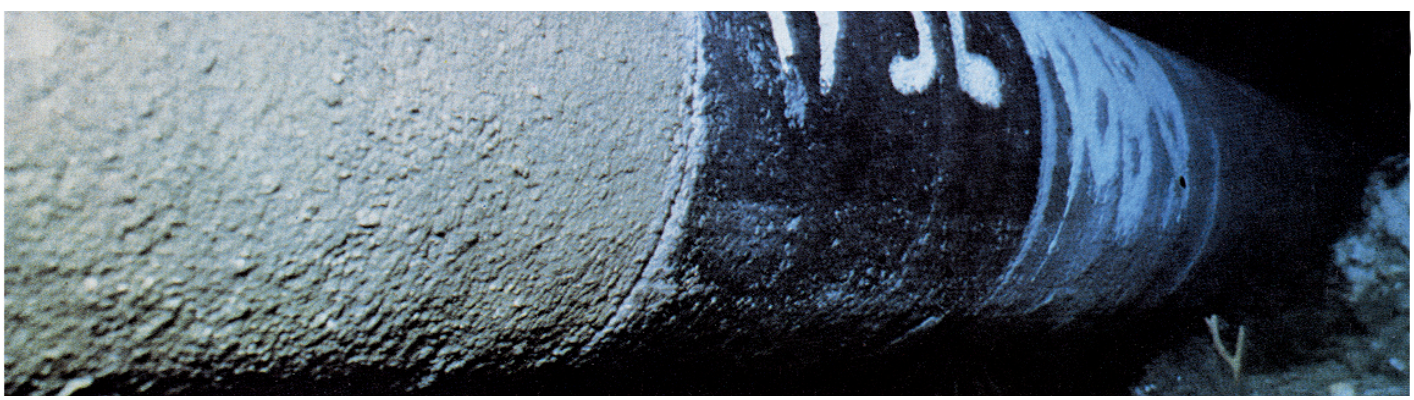
Prerequisite:
Basic knowledge in pipeline engineering and familiar with DNVGL-RP-F105 is required.

**Description**
This is an introductory course to FatFree software and its features for the calculation of VIV fatigue life according to DNVGL-RP-F105 "Free Spanning Pipelines".

The course focuses on the software features and correspondence between software input/output and the parameters of the RP. The course consists of presentations and workshops with hands-on experience of FatFree.

**Learning objectives**
You will learn how to use FatFree software in an efficient way and take advantage of the advanced software features in order to perform fatigue check due to vortex induced vibrations of free spanning pipelines.

**Target group**
Pipeline engineers performing fatigue analyses of free spanning pipelines according to DNVGL-RP-F105.



# ANALYSIS OF ON-BOTTOM STABILITY FOR PIPELINES USING STABLELINES

## Course code: SE-35
## Duration: 1 day

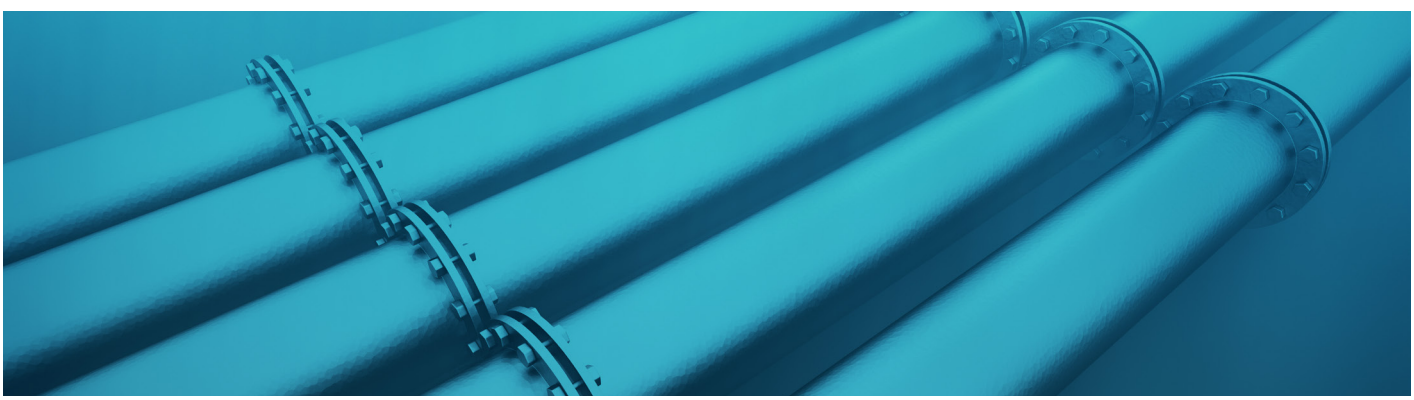
Prerequisite:
Basic knowledge in pipeline engineering and familiar with DNVGL-RP-F109 is required.

**Description**
This is an introductory course to StableLines software and its features for the calculation of on-bottom stability according to DNVGL-RP-F109 "On-Bottom Stability Design of Submarine Pipelines".

The course focuses on the software features and correspondence between software input/output and the parameters of the RP executed by subsequent presentation and workshops.

**Learning objectives**
You will learn how to use StableLines software in an efficient way and take advantage of the advanced software features in order to do on-bottom stability analysis of pipelines.

**Target group**
Pipeline engineers performing fatigue analyses of free spanning pipelines according to DNVGL-RP-F109.



# TRANSPORTATION ANALYSIS OF OFFSHORE STRUCTURES

## Course code: SE-36
## Duration: 4 days

Prerequisite:
It is required that the participants have attended SE-01 and SE-06, alternatively SE-04 or SE-16, or have similar knowledge use of GeniE, HydroD, Wadam and Sestra.

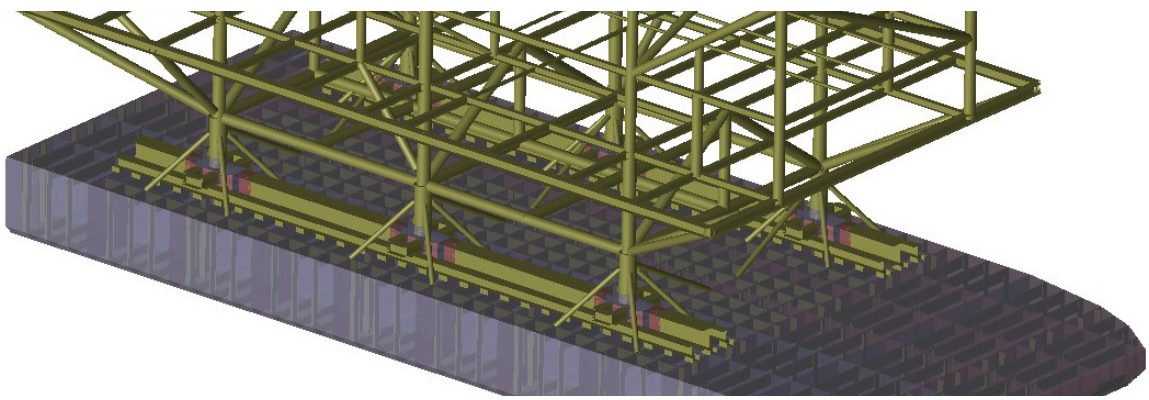
**Description**
The course focuses on running transportation analysis by direct hydrodynamic and strength analysis methods, global structural analysis and spectral ULS calculations. The model used throughout the course consists of a topside, deck support frame (DSF) and transportation barge, prepared in GeniE.

Practical point of view, pre-seafastening and seafastening conditions will be investigated together. The hydrodynamic environment modelling is done in HydroD and the hydrodynamic analysis in Wadam.
Design wave will be selected in Postresp by long term response calculation. Selected design wave are transferred to the structural FE model by load transfer in HydroD, and structural analysis will be performed in Sestra. Hydrodynamic and structural results for ULS analysis are presented in Xtract. Simplified strength evaluation of topside by using RAO tool will be introduced. Code checking of beams and plates for topside, DSF and barge is performed in GeniE. Long term stress distribution for extreme condition will be investigated in Stofat.

The course focuses on practical use of the various modules of Sesam in the transportation analysis workflow.

**Learning objectives**
You will learn how to perform necessary steps of assessing the structural integrity of barge and relevant structure for transportation conditions.

**Target group**
Structural engineers working in the field of transportation and installation for ship and offshore structures.



# FNCORROSION FOR ASSESSMEN OF CATHODIC PROTECTION SYSTEM DESIGN

## Course code: SE-37
## Duration: 2 days

Prerequisite:
Basic GeniE and Xtract proficiency, SE-01 or equivalent level.

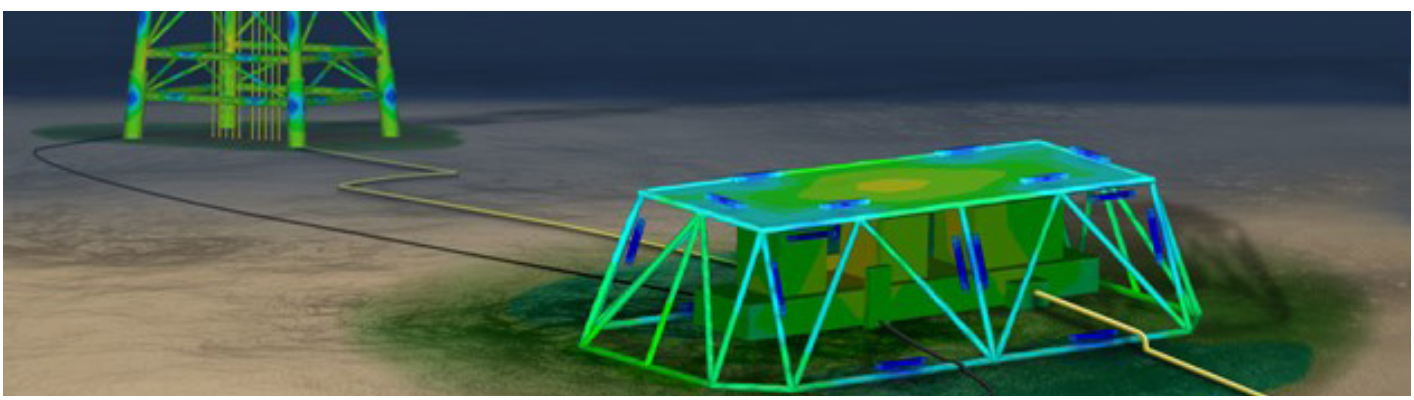
**Description**
The course introduces the FNCorrosion module, demonstrating the work flow and discussing the art of the possible. Geometry and mesh pre-processing is undertaken in GeniE, boundary conditions and solver settings are set in the FNCorrosion GUI, and results are viewed in Xtract and Notepad.

See how FNCorrosion can assess the coverage of cathodic protection (passive anodes and/or ICCP) through the life of a structure. Discuss how models can be improved with on-site measurements, and how to identify corrosion risk locations for incorporation into inspection strategy.

The course will include a run through of 3 tutorial cases:
1. Monopile with passive anode elements
2. Semi-submersible with ICCP
3. Jacket structure with ICCP

**Learning objectives**
You will learn how to use Sesam to assess cathodic protection system design:
- The benefits of modeling cathodic protection systems
- Learn how to use GeniE to construct panel models for FNCorrosion
- Selection and editing boundary conditions
- Solver settings and troubleshooting
- Reviewing the results in Xtract

**Target group**
Material and corrosion engineers, or structural engineers supporting corrosion and material specialists.



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