



DIGITAL SOLUTIONS

# TRAINING CATALOGUE

Ship design and verification

**Nauticus**

# CONTENTS

## NAUSICUS

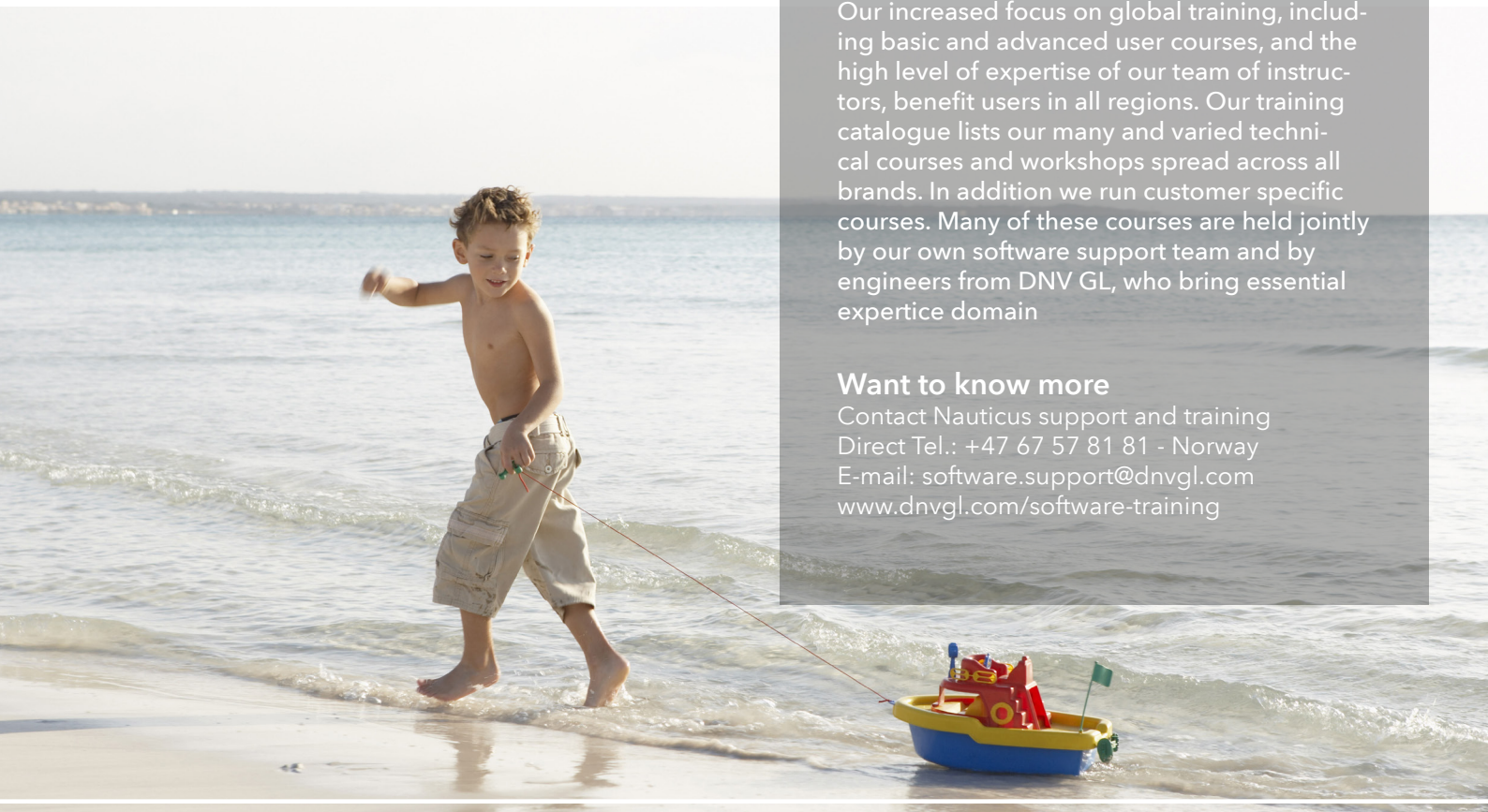
Course code	Title	Duration	Page
NA-02	Nauticus Hull rule check analysis	2 days	03
NA-08	Nauticus Hull - 3D Beam	0.5 days	04
NA-09	Nauticus Hull - PULS buckling	0.5 days	05
NA-10	Nauticus Machinery shaft alignment basic	1 day	06
NA-11	Nauticus Machinery shaft alignment advanced	3 days	07
NA-12	Nauticus Machinery torsional vibration basic	1 day	08
NA-13	Advanced shafting design for marine propulsion systems	2-3 days	09
NA-14	Nauticus Machinery shaft fatigue with ice class	1 day	10
NA-17	Nauticus Hull cargo hold FE analysis - CSR BC & OT	3 days	11

### 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 GL, who bring essential expertise domain

### Want to know more

Contact Nauticus support and training  
 Direct Tel.: +47 67 57 81 81 - Norway  
 E-mail: [software.support@dnvgl.com](mailto:software.support@dnvgl.com)  
[www.dnvgl.com/software-training](http://www.dnvgl.com/software-training)



# NAUTICUS HULL RULE CHECK ANALYSIS

**Course code: NA-02**

**Duration: 2 days**

**Prerequisite:**  
Basic understanding of ship structures and hull strength.

## Description

The course is an introduction to the Nauticus Hull program for rule compliance checks on hull girder strength, and plate and stiffener scantling checks for a hull cross section. The main focus is on cross-section modelling and analyses executions. The course covers how to use the software for DNV Rules, DNV GL rules and Common Structural Rules for Bulk Carriers and Oil Tankers (CSR BC & OT).

## Learning objectives

After the course, you should be able to use Nauticus Hull to carry out compliance checks on the hull girder and cross sections according to rule requirements.

The following topics will be covered:

- Describing ship particulars and main data
- Describing tank plan, compartments and loads
- Scantlings modelling
- Prescriptive rule check analyses
- Fatigue analyses
- Results presentation

Most of the procedures and methodology are common for all sets of rules. Where there are differences, the course will cover the alternatives for rules that are relevant for the participants.

## Target group

Naval architects, designers, hull structural engineers and approval engineers with no experience in using Nauticus Hull for rule check analyses.



## NAUTICUS HULL - 3D BEAM

**Course code: NA-08**  
**Duration: 0.5 days**

**Prerequisite:**  
 Basic understanding of the FE method and strength calculations.

### Description

The course is a presentation of the 3-dimensional frame structure analysis program 3D Beam. This program can be used at an early stage for evaluation of strength of ship frames, as well as grid structures and frame structures in general. The course will describe how to create geometry, apply profiles, material, loads etc., and present the analyses results in way of displacements and beam forces and stresses.

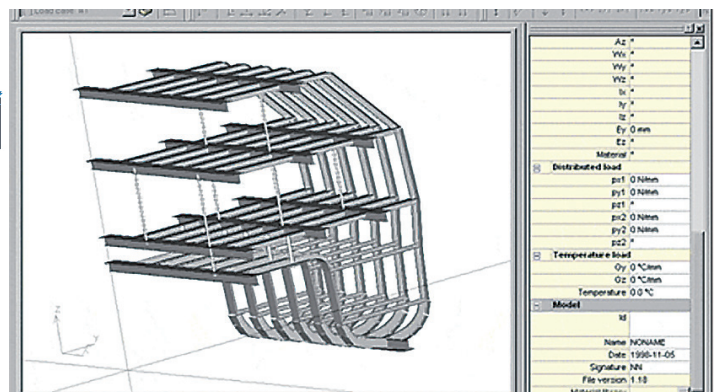
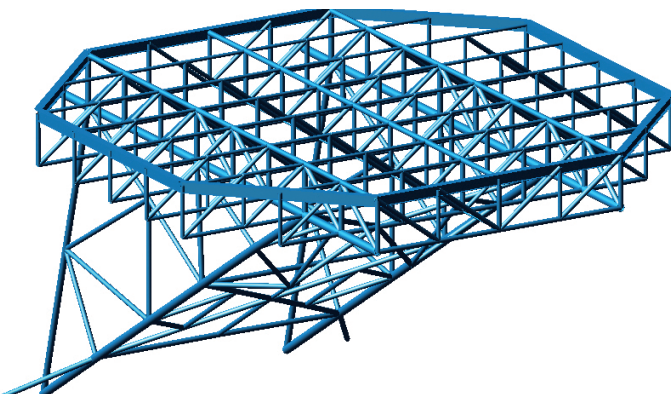
The course will be a combination of lectures and hands-on training. The hands-on training will be a detailed step-by-step description of the modelling and analysis process.

### Learning objectives

After the course you should be able to carry out beam element analysis using 3D Beam.

### Target group

Naval architects, designers, hull structural engineers and approval engineers with no or limited experience using Nauticus Hull.



# NAUTICUS HULL – PULS BUCKLING

**Course code: NA-09**  
**Duration: 0.5 days**

**Prerequisite:**  
Basic understanding of structural strength and plate buckling theory.

## **Description**

The course is an introduction to the PULS (Panel Ultimate Limit State) program for buckling and ultimate strength capacity assessments of stiffened and unstiffened panels based on non-linear large deflection plate theory. PULS can be used in typical planar building blocks in ship hull structures as well as in general planar stiffened, unstiffened or corrugated plate structures.

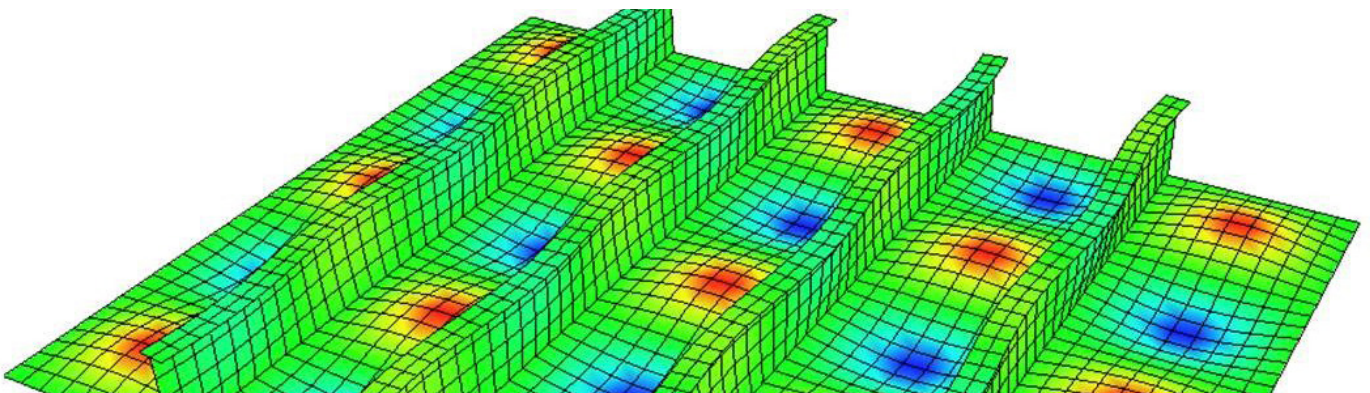
The course will mainly be based on hands-on training, presenting some typical problems where PULS can be used for assessment and understanding of the buckling and non-linear behaviour.

## **Learning objectives**

After the course you should be able to use PULS to calculate ultimate buckling capacities of stiffened or unstiffened plates.

## **Target group**

Naval architects, designers, hull structural engineers and approval engineers with no or limited experience using Nauticus Hull.



# NAUTICUS MACHINERY SHAFT ALIGNMENT BASIC

**Course code: NA-10**

**Duration: 1 day**

**Prerequisite:**  
Some understanding of shaft alignment analysis and verification methods.

## Description

The course covers the basic parts of Nauticus Machinery Shaft Alignment intended for shaft alignment in direct coupled or geared propulsion systems.

The following topics are covered:

- Basic geometry modelling, shaft- and bearing wizards
- Applying materials, buoyancy corrections, loads
- Modelling propeller, bearings, shrink fits, gears and engines
- Calculation and reporting
- Optimization and reverse engineering features
- Verification methods such as gap/sag, strain gauge or hydraulic jacking

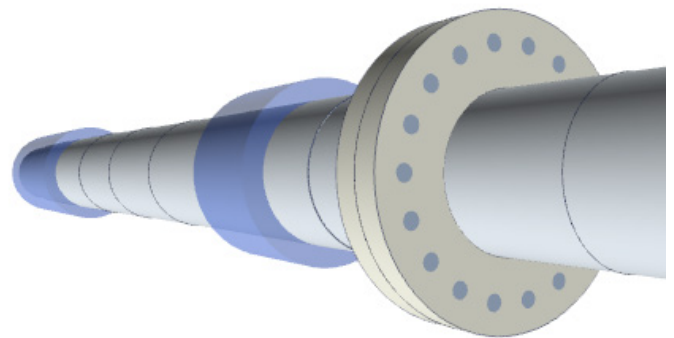
## Learning objectives

We focus on use of the software in this basic course. It means that general theory or Classification Rules are not covered.

Throughout presentations and hands-on training you will learn how to use Nauticus Machinery Shaft Alignment effectively. The design, verification and troubleshooting ("reverse engineering") aspects will be covered. You will also learn how to optimize the alignment using the more advanced features of the software.

## Target group

Naval architects, designers, ship yards and approval engineers with no or limited experience using Nauticus Machinery.



# NAUTICUS MACHINERY SHAFT ALIGNMENT ADVANCED

**Course code: NA-11**  
**Duration: 3 days**

**Prerequisite:**  
Detailed knowledge about marine propulsion systems and basic understanding of shaft alignment analysis, verification methods and measurements.

## **Description**

The course covers DNV GL's theoretical and practical experience within the fields of shaft alignment, whirling and axial vibrations and relates these to good practice for carrying out calculations utilizing the Nauticus Machinery Shaft Alignment tool. Basic theory will be taught, and the course will give an insight into new technology gained by DNV GL through several comprehensive research and troubleshooting projects.

## **Learning objectives**

The main objective is to learn best practice for shaft alignment by learning theory, analysis methods and use of the software. Each component in the system (propeller, bearing, couplings, gear, engines) will be covered in detail with extensive presentation material, know-how and experience from state-of-the-art research projects.

## **Target group**

Naval architects, designers, ship yards and approval engineers with no or limited experience using Nauticus Machinery, but with some experience within the field of shaft alignment.



# NAUSICUS MACHINERY TORSIONAL VIBRATION BASIC

**Course code: NA-12**

**Duration: 1 day**

**Prerequisite:**

Some understanding of torsional vibration analysis inclusive excitation models for engine and propeller.

## **Description**

The course covers all parts of Nauticus Machinery Torsional Vibration intended for steady-state torsional vibration analysis in direct coupled or geared propulsion systems.

The course will include hands-on training with relevant models. Different types of propulsion systems such as electric, gas turbine, diesel engine and geared systems are covered.

The following topics are covered:

- Create mass elastic model
- Stiffness and damping calculators
- Acceptance criteria
- Define load cases
- Calculation and reporting

## **Learning objectives**

We focus on use of the software in this basic course. It means that general theory or Classification Rules are not covered. Throughout presentations and hands-on training you will learn how to use Nauticus Machinery Torsional Vibration effectively.

## **Target group**

Naval architects, designers, ship yards and approval engineers with no or limited experience using Nauticus Machinery.





# ADVANCED SHAFTING DESIGN FOR MARINE PROPULSION SYSTEMS

**Course code: NA-13**  
**Duration: 2-3 days**

**Prerequisite:**  
Knowledge about propulsion components such as propeller, shafts, couplings, dampers, gears and engines. Some knowledge about shaft fatigue analysis and frequency domain analysis of propulsion systems.

## **Description**

The course covers the following topics:

- Steady state and transient vibrations (frequency and time domain analysis)
- IACS unified requirements for shaft fatigue
- DNV GL's detailed shaft design method
- Simulation of transient load responses
- Calculation cases and design options

The course is primarily focusing on technology, but will cover the Nauticus Machinery Torsional Vibration and Nauticus Machinery Shaft Fatigue tools.

## **Learning objectives**

Learn how to optimize your shafting design using DNV GL's detailed shaft design approach and relevant Nauticus Machinery tools.

## **Target group**

Naval architects, designers, ship yards and approval engineers with detailed knowledge about overall design of marine shafting systems.



# NAUTICUS MACHINERY SHAFT FATIGUE WITH ICE CLASS

**Course code: NA-14**

**Duration: 1 day**

**Prerequisite:**  
Some understanding of shaft fatigue analysis and ice class requirements of the propulsion system.

## **Description**

The course covers DNV GL's detailed shaft design method and strength capacity requirements on shafting according to Finnish-Swedish Ice Class and IACS Polar Ice Class.

The following topics are covered:

- DNV GL's simplified and detailed shaft design method
- Ice class strength requirements on shafting
- Estimate ice impacting torque and its response on the shafting
- Blade failure load check
- Cumulative fatigue strength analysis
- Parameter studies for stress concentration factors

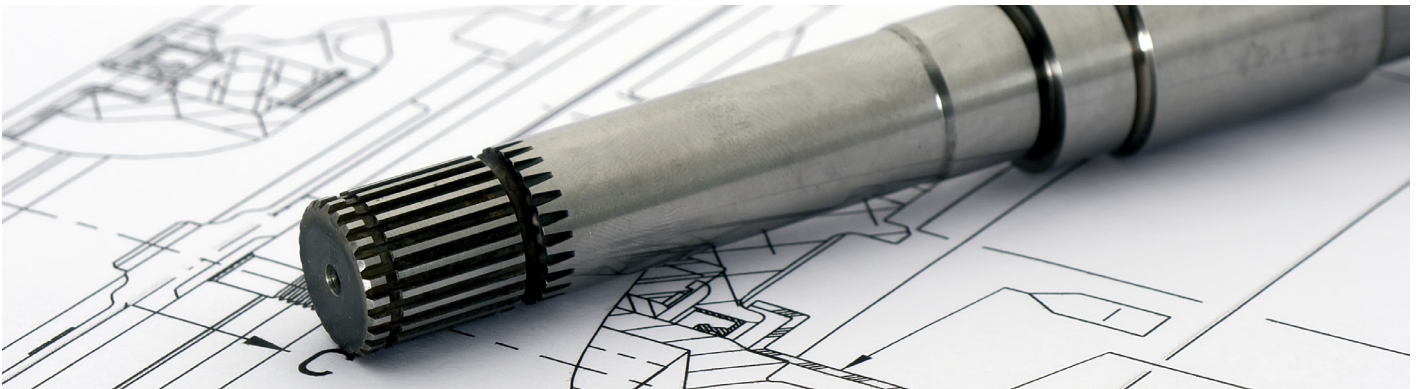
## **Learning objectives**

The main objective is to learn DNV GL's simplified and detailed shaft design method and code check of ice class strength requirements on the shafting by using Nauticus Machinery Shaft Fatigue.

Throughout presentations and hands-on training you will learn how to use Nauticus Machinery Shaft Fatigue and how to check the additional ice class strength effectively.

## **Target group**

Naval architects, designers, ship yards and approval engineers with no or limited experience using Nauticus Machinery and limited understanding of ice class rules.



# NAUTICUS HULL CARGO HOLD FE ANALYSIS - CSR BC & OT

**Course code: NA-17**  
**Duration: 3 days**

**Prerequisite:**  
Basic understanding of ship structures and use of FE analysis for hull strength calculations. Knowledge in Nauticus Hull as covered in NA-02 Nauticus Hull rule check analysis. Basic knowledge in Sesam for fixed structures as covered in SE-01 Concept based FE modelling and analysis using Sesam - Introductory.

## Description

The course is an introduction to programs for FE analyses of the cargo hold area in accordance with the IACS Common Structural Rules for Bulk Carriers and Oil Tankers (CSR BC & OT).

- Prepare cargo hold model
- Transfer of rule loads, boundary conditions and corrosion additions
- Hull girder load adjustment
- Verify model
- Yield strength assessment - coarse mesh
- Buckling assessment
- Screening and reporting
- Local structural strength
- Fine mesh models
- Hot spot fatigue

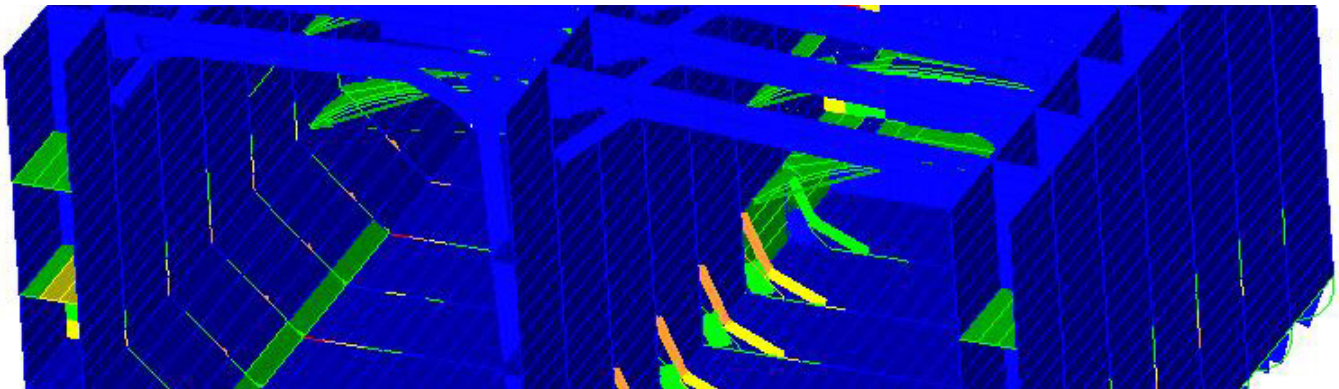
The course will be a combination of lectures and hands-on training, including applying of loads to a cargo hold model, analysing it and carry out stress and buckling assessment including hot spot fatigue, according to CSR BC & OT. The course will also provide a brief presentation of the IACS Common Structural Rules for Bulk Carriers and Oil Tankers.

## Learning objectives

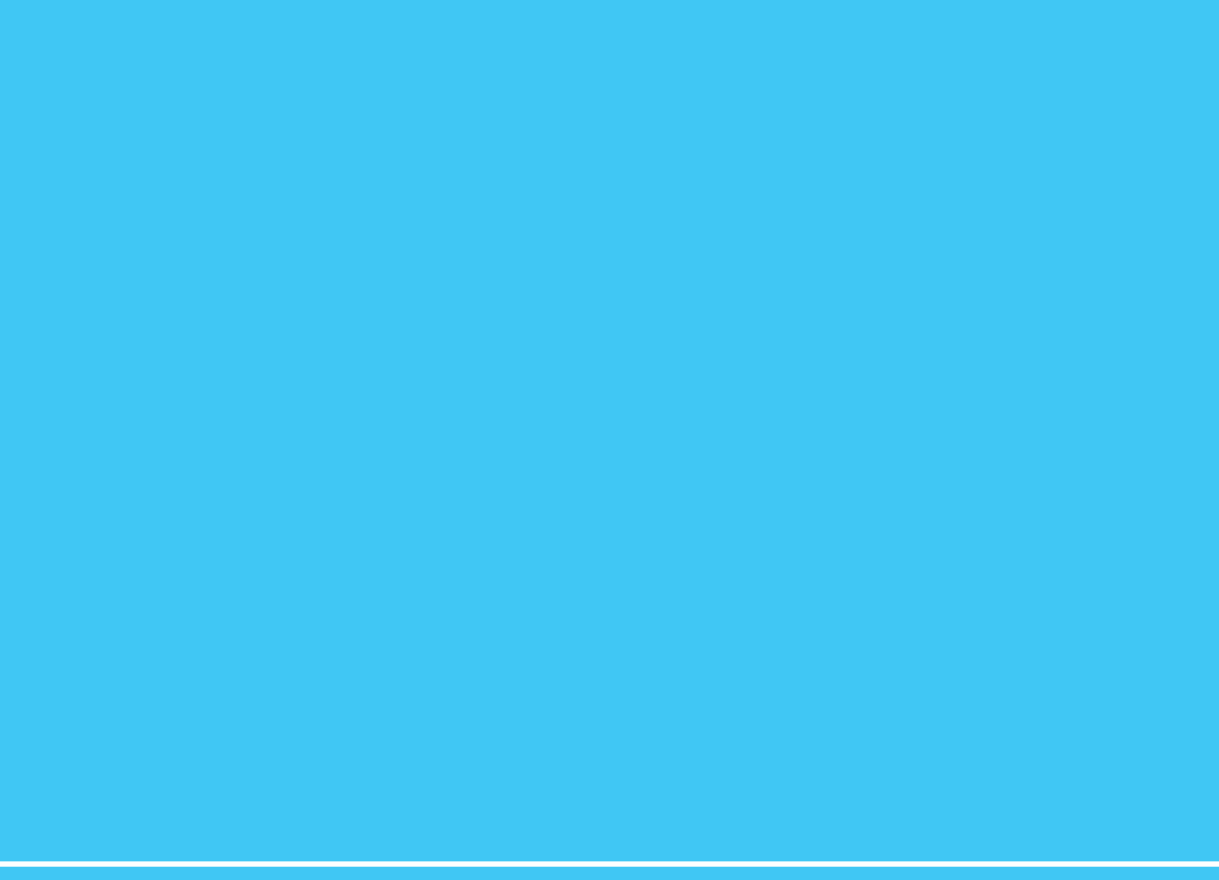
After the course you should be able to use Nauticus Hull for cargo hold analysis and execute FE analyses and code check for direct strength, buckling and fatigue assessment.

## Target group

Naval architects, designers, hull structural engineers and approval engineers with no or limited experience using Nauticus Hull for CSR BC & OT.



SAFER, SMARTER, GREENER



**DNV GL AS**

NO-1322 Høvik, Norway  
Tel: +47 67 57 99 00  
[www.dnvgl.com](http://www.dnvgl.com)

**DNV GL**

DNV GL is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification and supply chain services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter and greener.

**Digital Solutions**

DNV GL is a world-leading provider of digital solutions for managing risk and improving asset performance for ships, pipelines, processing plants, offshore structures, electric grids, smart cities and more. Our open industry platform Veracity, cyber security and software solutions support business-critical activities across many industries, including maritime, energy, and healthcare.