

Introduction to OrcaFlex Training Course Syllabus

The course assumes no prior experience with the software and is organised as a series of lectures and practical sessions. The course is intended to be 'hands on' and we encourage attendees to follow the trainer's actions throughout.

1. Introduction

- General introduction / background to OrcaFlex.
- Program windows.
- Introduction to the 9 available objects.

2. Catenary riser (example 1)

- 3D view, model browser, navigating the view.
- Global origin.
- Wire frame vs shaded graphics.
- Adding / editing objects.
- Local origins, default data.
- Making connections (not all objects can connect together).
- Line end connection options.
- Commonly used navigation short cut keys.
- Adding multiple views, creating workspace files.
- Data files – difference between *.dat* and *.yml*.
- Running and saving a simulation.
- Help file, F1, contextual help.

3. Static analysis (example 2)

- OrcaFlex solves individual line statics first then whole system statics.
- Statics progress window.
- Step 1 and Step 2 line statics stages.
- Effect of changing max iterations, tolerance, min/max damping.
- When to change to mag. std. error & change.

4. Dynamic analysis (example 3)

- Time domain and frequency domain analysis.
- Implicit integration scheme.
- Explicit integration scheme.

5. Replays and results

- Replay control options, including start/stop, step forward/backward, replay speed, keyboard shortcuts.
- Replay parameters, including restart and custom replays.
- Video export as avi or pdf snapshots for current view only.

6. The line object (example 4)

- Introduction to the line data form.

Line theory

- Nodes and segments.
- Segments cannot bend, all bending at nodes.
- How compression in segments is treated.
- Including / excluding torsion.

Line type data

- Homogeneous vs. general categories.
- Geometry and mass, structure, etc. pages on line types form.
- Variable data.
- Line type wizard.

7. Line end connections (example 5)

- End connection stiffness settings: pinned, infinity, finite.
- End fitting angle.
- Azimuth, declination and gamma.
- Option to automatically calculate line section lengths and end orientations based on end positions (useful for truss modelling).

8. Line attachments (example 6)

- Types (clumps, flex joints and bend stiffeners).
- Properties data.
- Clump "align with" option.
- Attachments can only be connected at a node.

9. Line contents (example 7)

- Difference between uniform, free flooding, slug flow, and tabular contents.

10. Shapes and contact (example 8)

- Only some objects are permitted to contact each other.
- Introduction to contact options (shapes, line clashing, line contact, supports).
- Different shape geometries (cylinder, block, plane, curved plate).
- Different shape types (elastic solid, trapped water, drawing, wire frame, label).
- Elastic solid type shape for contact.
- Linear or non-linear reaction force.
- Friction coefficients.

11. Seabed friction and model browser (example 9)

- How friction is handled in statics.
- What is the lay azimuth and how is it set?
- Tangential resistance profiles as an alternative to the Coulomb friction model.
- Model browser features including copy/paste, move selected objects, locate, show/hide.

12. Link and winches (example 10)

Links

- Massless, dragless.
- Differences between tether and spring/damper type.

Winches

- Massless, dragless.
- Contrast with line feeding.
- Multiple control points (frictionless).
- Control payout, payout rate or tension.
- Simple and detailed types.

13. Vessels and diffraction (example 11)

- Represent rigid bodies in diffraction regime.
- Diffraction data must be pre-calculated and then imported into OrcaFlex.
- Calculation page options (primary / superimposed motion, included effects).
- Assistance for specific packages given in the OrcaFlex help.
- Diffraction data can be generated by OrcaWave.
- OrcaWave, WAMIT or AQWA output files can be imported directly.
- Generic text file data require some mark-up.

14. 3D and 6D buoys (example 12)

- Represent rigid objects in drag/inertia regime (using Morison's equation).
- Wings allow lift/drag characteristics to be applied as a function of buoy angle.
- 3D buoys.
- 6D lumped buoys.
- 6D spar and towed fish buoys.

15. Constraints (example 13)

- Provide a means of controlling individual degrees of freedom.
- Degrees of freedom can be calculated or imposed (time history).
- Free constraints can also be used as connection points for other objects.
- Applying stiffness and damping.

16. Environment (example 14)

- Sea page.
- Water density settings.
- Weather directions set relative to global axis system.

Seabed

- Can be flat, profiled, 3D.
- Elastic and non-linear soil models for normal direction. Lateral/axial models can be included via line-specific tangential resistance profiles.
- Line-specific vertical resistance options for upheaval buckling in buried lines.

Current

- Interpolated or power law profile.
- Multiple data sets can be defined but only one active at a time.

Wind

- Constant or time-varying.

Waves

- Multiple wave trains act in combination.
- Regular or irregular waves.
- Build-up period.
- Waves Preview.

17. Variation files and restarts (example 15)

Variation files

- Introduction to variation files, parent/child models and change tracking.
- File compare.

Restarts

- Can be used for both static and dynamic analyses, and a combination of both.
- Allows the Inheriting of conditions from a prior analysis and changing the state of objects in a model.

18. Automation (example 16)

- OrcaFlex spreadsheet and API options.

Pre-Processing

- Text data files.
- File compare.

Batch Processing

- Batch form in OrcaFlex.

Post-Processing

- Spreadsheet instructions wizard.
- How to process cases.
- Duplicate instructions.