# Naval Architecture and Offshore Structures

***Design of Ships and Ocean Engineering Equipment***

***Academic Year 2025/2026***

1. Describe typical hazards encountered in water transport.
2. Explain the ALARP risk criterion.
3. List the stages of a safety assessment (FSA).
4. Discuss the selected method for assessing the probability of human error.
5. Define reliability from a probabilistic perspective.
6. Conduct a risk analysis of a selected technical object.
7. Project risk management.
8. Sea current profiles – approximating functions.
9. Regular waves – sketch, symbols, equation and wave properties.
10. Irregular waves – sketch, symbols and equation.
11. Particle trajectories in waves (deep water, intermediate depth, shallow water).
12. Wave spectrum – approximations and parameters influencing the spectrum shape.
13. Wind – stationary models (wind profile), functions and parameters.
14. Applied wind spectrum functions and non-stationary wind speed model.
15. Modeling the impact of a waved sea on a cylindrical structure.
16. Random event and probability of a random event.
17. Random variables and examples of distributions.
18. Statistical inference – point and interval estimation.
19. Definition and classification of stochastic processes.
20. Conditions for the existence of an extremum of a multivariable function.
21. Method of undetermined Lagrange multipliers.
22. Interpolation using the Lagrange polynomial.
23. Interpolation using splines.
24. Materials used in the construction of floating and offshore engineering structures.
25. Shaping the structure and properties of metals and alloys using technological methods.
26. Wear mechanisms of structural materials.
27. Discuss methods for identifying and avoiding resonant motions of floating structures during the design phase.
28. The importance of seagoing vessels in the global transport system.
29. Equipment of container and bulk cargo terminals.
30. Intermodal transport – advantages and disadvantages.

***The list below is intended to cover the key technical content of the specialisation in a structured and exam-oriented form.***

31. Describe the problem of the limit load capacity of the ship's hull.
32. To what problems are FSI methods applied to.
33. Describe the problem of uncertainty in strength modeling.
34. Advanced Materials in Shipbuilding.
35. Structural Integrity and Fatigue Analysis.
36. Innovations in Hull Design.
37. Automation and Digitalization in Ship Design.
38. Environmental Sustainability in Ship Construction.
39. What is approximation and interpolation?
40. What are shape functions?
41. What types and how many degrees of freedom can be distinguished at a given node?
42. How is the convergence of the method investigated?
43. What is CFD?
44. Classification of Numerical Methods.
45. Methods for Modeling Potential Flows.
46. Methods for Determining Viscous Flows – Finite Volume Method.
47. Computational Meshes.
48. Techniques Used for Solving Systems of Linear and Nonlinear Equations.
49. Describe the dynamic phenomena covered by the Second Generation Intact Stability Criteria and the conditions under which they occur.
50. Principles of operation of dynamic positioning systems of different classes and their applications.
51. The role of sensors in ship positioning systems and their impact on control accuracy.
52. The use of control algorithms in ship positioning systems.
53. Methods of modeling ship motion and their applications.
54. Compensation of environmental disturbances in DP systems.
55. Diagram of the mooring system of a large cargo ship.
56. Schematic diagram of the ballast system of a small ship.
57. Diagram of the refrigeration system and name the important components.
58. Present the principles for selecting main engines, generator sets, and boilers.
59. Provide the formula for the energy efficiency of the engine room and discuss methods for improving efficiency.
60. Methods for selecting pumps, heat exchangers, filters, and fittings.