Naval Architecture and Ship Technology for Non-Naval Architects: Hull, Stability and Machinery

3 – 14 October 2027
Jeddah - Corniche four-star



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Introduction:

Ship technology and naval architecture decisions reach superintendents, surveyors, underwriters and terminal staff every day, yet many of them read a stability booklet, a thickness gauging report or a class status without the background to question it. Loading errors, missed free surface corrections and unnoticed wastage in hull girders then become casualties, claims or off-hire. This Core Concept course gives non-naval architects the working grasp of hull form, structure, hydrostatics, stability, propulsion and machinery needed to check a vessel. Each participant completes a Ship Technical Review and Stability Check Report for a case vessel.

Course Objectives:

- Interpret principal dimensions, hull form coefficients and hydrostatic curves to explain how a ship type's design drivers shape its capacity and behaviour
- Identify primary, secondary and tertiary structural members, framing systems and steel grades on a midship section drawing and relate them to longitudinal strength
- Calculate displacement, KG, corrected GM and trim for a loading condition and read a GZ curve against the intact stability criteria in the vessel's booklet
- Assess resistance, propeller, rudder, main engine and auxiliary system arrangements and recognise the defects that threaten propulsion and power supply
- Evaluate corrosion, coating breakdown, class survey status and dry-dock findings to judge the technical condition of a vessel
- Produce a Ship Technical Review and Stability Check Report that states findings, risks and recommended actions for a case vessel

Target Audience:

- Managers responsible for the technical superintendence and maintenance oversight of owned or managed vessels
- Managers responsible for marine operations, berthing and cargo handling at ports and terminals
- Managers responsible for hull, machinery and condition surveys on behalf of owners, buyers or financiers
- Managers responsible for marine hull and machinery underwriting, risk surveys and casualty claims
- Managers responsible for fleet technical performance, vetting preparation and vessel acceptance in shipping companies

Course Outline:

Day 1: Ship Types, Design Drivers and Principal Dimensions

- Merchant Ship Type Map: Bulk Carrier, Tanker, Container Ship, Gas Carrier, Ro-Ro and Offshore Support Vessel
- Design Spiral and Owner Requirement Drivers: Deadweight, Speed, Cargo Volume and Draught Limits
- Principal Dimensions: Length Overall, Length Between Perpendiculars, Moulded Breadth, Depth and Draught
- General Arrangement Drawing Reading: Holds, Tanks, Engine Room, Accommodation and Cofferdams
- Lines Plan, Body Plan and Offsets Table Interpretation

Day 2: Hull Form Coefficients, Hydrostatics, Tonnage and Load Lines

- Block, Prismatic, Midship and Waterplane Coefficients and What They Reveal About Hull Fullness
- Archimedes Principle, Displacement, Reserve Buoyancy and Tonnes Per Centimetre Immersion
- Hydrostatic Curves and Tables: KB, BM, KM, LCB, LCF and MCTC
- Gross and Net Tonnage Versus Deadweight and Lightship: Uses in Dues, Manning and Contracts
- Load Line Marks and Freeboard: Plimsoll Disc, Seasonal Zone Marks and Fresh Water Allowance

Day 3: Hull Structure, Steel Grades and Structural Members

- Hull Girder Bending: Hogging, Sagging, Still-Water and Wave Bending Moments and Shear Forces
- Transverse, Longitudinal and Combined Framing Systems on a Midship Section Drawing
- Primary, Secondary and Tertiary Members: Keel, Girders, Floors, Frames, Stiffeners and Bulkheads
- Mild and Higher-Tensile Shipbuilding Steel Grades, Aluminium Superstructures and Weld Joint Details
- Structural Details Prone to Cracking: Hatch Corners, Bracket Toes and Stiffener End Connections

Day 4: Intact Stability: GM, GZ Curves and Free Surface

- Centre of Gravity, Centre of Buoyancy and Metacentre: Initial Stability and the GM Value
- KG Calculation by Moments for Cargo, Ballast, Fuel and Stores Items
- Free Surface Effect: Slack Tank Moments and the Corrected GM
- Righting Lever GZ Curve from Cross Curves: Area, Maximum Lever and Angle of Vanishing Stability
- Intact Stability Criteria Check Against Booklet Limits and Stiff Versus Tender Ship Behaviour

Day 5: Loading Conditions, Trim, Damage Stability and Stability Booklet Case

- Trim, List and Draught Survey Calculations Using LCF and MCTC
- Loading Computer Output Review: Shear Force and Bending Moment Against Permissible Limits
- Damage Stability Concepts: Subdivision, Watertight Integrity, Lost Buoyancy and Added Weight Methods
- Stability Booklet Anatomy: Lightship Particulars, Tank Tables, Sample Conditions and Limiting KG Curves
- Guided Case: Departure and Arrival Condition Stability Check for a Case Bulk Carrier

Day 6: Resistance, Propulsion, Propellers and Rudders

- Hull Resistance Components: Frictional, Wave-Making and Air Resistance and the Effect of Hull Fouling
- Powering Chain: Effective, Delivered, Shaft and Brake Power and Propulsive Efficiency
- Fixed-Pitch and Controllable-Pitch Propellers: Pitch, Blade Area, Cavitation and Blade Damage Patterns
- Shafting, Stern Tube Seals, Bearings and Shaft Withdrawal Surveys
- Rudder Types, Steering Gear Arrangements and Manoeuvring Characteristics in Port Approaches

Day 7: Main Engines, Auxiliary Machinery, Electrical and Piping Systems

- Two-Stroke Slow-Speed and Four-Stroke Medium-Speed Diesel Engines: Layout, Ratings and Common Failures
- Auxiliary Machinery: Generators, Boilers, Purifiers, Compressors and Fresh Water Generators
- Main Switchboard, Emergency Generator and Power Management: Blackout Causes and Recovery
- Ballast, Bilge, Fuel and Cargo Piping Systems: Valves, Remote Operation and Line Diagrams
- Machinery Space Fire Risks: Hot Surfaces, Fuel Leaks and Fixed Extinguishing Arrangements

Day 8: Corrosion, Coatings, Classification and Statutory Surveys

- Corrosion Mechanisms in Ballast Tanks, Cargo Holds and Void Spaces: General, Pitting and Grooving
- Protective Coating Systems, Cathodic Protection Anodes and Coating Condition Rating
- Thickness Gauging Reports: Original Thickness, Allowable Diminution and Substantial Corrosion Areas
- Classification Society Role, Class Notations and the Annual, Intermediate and Special Survey Cycle
- Statutory Certificates Issued on Behalf of Flag Administrations, Conditions of Class and Memoranda

Day 9: Dry-Docking, Repair and Ship Condition Assessment

- Dry-Dock Specification Writing: Hull Blasting, Painting, Sea Chests, Valves and Propeller Polishing
- Docking Plan, Block Loads and Stability While Entering and Leaving the Dock
- Steel Renewal, Crack Repair and Temporary Repair Approval Procedures
- Condition Assessment Walkthrough: Hull, Deck, Hatch Covers, Machinery Spaces and Records Checklist
- Technical Defect Risk Ranking Matrix for Owners, Buyers, Underwriters and Terminals

Day 10: Capstone: Ship Technical Review and Stability Check Report

- Case Vessel Data Pack: General Arrangement, Stability Booklet, Gauging Report and Class Status
- Team Stability Check: Loading Condition, Corrected GM, GZ Criteria and Longitudinal Strength
- Team Technical Review: Structure, Coatings, Propulsion and Machinery Findings
- Drafting the Ship Technical Review and Stability Check Report with Prioritised Actions
- Report Presentation and Challenge Panel of Superintendents, Surveyors and Underwriters

Skills You Will Gain:

- Hydrostatic Table Interpretation
- Metacentric Height and Righting Lever Analysis
- Midship Section Reading
- Longitudinal Strength Checking
- Propulsion Train Defect Recognition
- Thickness Gauging Evaluation
- Class Survey Status Review
- Dry-Dock Scope Planning

Why Attend This Course:

- Return with a Ship Technical Review and Stability Check Report prepared on a case vessel with documents of the kind used in practice
- Question a loading plan, a gauging report or a repair quotation with a clear view of the hull, stability and machinery facts behind it
- Speak the vocabulary of naval architects, class surveyors and chief engineers when a casualty, claim or vetting finding is discussed
- Test judgement against peers from ship management, terminals, survey firms and insurers working on bulk, tanker, container and offshore tonnage

Conclusion:

Sound technical judgement on a vessel depends on seeing how its hull form, structure, stability, propulsion and machinery fit together. Week one builds that base through ship types, dimensions, form coefficients, hydrostatics, tonnage, load lines, structural members, GM, GZ curves, free surface, trim and damage stability. Week two adds resistance, propellers, rudders, engines, electrical and piping systems, corrosion and coatings, class and statutory surveys, dry-docking and condition assessment. The final day produces a Ship Technical Review and Stability Check Report for a case vessel.