

SMALL CRAFT DESIGN COURSE

#	Lecture	Contents
1	Introduction	Small craft types: pleasure, special, small commercial. Power and sailing boats. Design categories. Displacement, semi-planing and planing craft. Monohull and multihull craft. Regulations applied – ISO, LR SSC, etc. Review of problems involved in design and production.
2	Architecture of small craft	Architecture of hull and deck – types, applications. Aesthetics of small craft, exterior design. Art of design and styling – modern, classic, practical. Bow and stern shapes and their applications. Deck and cabin styling, functionality issues. Swimming platforms, stairs and ladders, visibility from steering station, etc.
3	Boat design process	Design spiral, analysis of prototypes, design rations, hull shape factors, preliminary sketching, study of weights, calculations. Hull shape design, types of hulls and their applications. Design evaluation, optimization.
4	Flotation and stability	‘Mechanism’ of flotation and stability, stability diagrams. Stability criteria: initial, at large angles of heel, wave/wind, special criteria, stability of flooded craft. Regulations, freeboard and stability requirements, ISO12217 overview, comparison with IMO Intact Stability Code.
5	Boat interiors design	Basics of interior planning, functionality, accommodation requirements, comfort factors, ergonomics. Basics of interior styling. Problems involved in boat interior design; cooperation of naval architect with interior designer.
6	Performance predictions	Relative speed and Froude numbers, components of resistance. Resistance calculations methods for displacement, semi-displacement and planing craft: simplified, systematic series, model testing.
7	Powering, seakeeping and controllability	Powering – types of drives; engine ratings. Interaction of engine with drive. Basics of seakeeping, accelerations, MSI/MIF/MII. Wetness and slamming, survival of craft in extreme conditions. Controllability as combination of directional stability and maneuverability, effect of different factors on controllability. Sea trials procedure, accuracy and methods of measurements.
8	Sailing boats design	Elements of wing theory, basics of sailboat dynamics, VPP and polar plots. Types of sailing rig. Development of sail plan: balance, dimensioning of sails and spar. Appendages design: rudder, keel, centerboards. Deck equipment specific for sailing boats.
9	Design and production in composites	Materials – resins, fabrics, cores. Development of lamination schedule. Construction methods: hand lay-up in mold, infusion, spray gun, temporary molds, panels kit assembling, etc.
10	Design and production in metal and wood	Design features for metal and wood. Materials, extrusions, species of wood. Development of metal or plywood kit. Construction techniques.
11	Structural design	Structural calculations for small craft – ISO12215-5 method. Full method and simplified method. General strength of hull, hull girder.

12	Deck equipment	Anchor, mooring, steering; their types and sizing. Requirements for deck hatches and openings, deck safety. Cockpit drains. Suppliers and use of catalogs.
13	Marine systems	Fuel (diesel, gasoline), water, bilge pumps, waste, ventilation, air-conditioning, LPG, firefighting systems on small craft. Requirements. Suppliers and use of catalogs.
14	Marine electrical systems	AC and DC systems on boats, requirements, samples. Load analysis. Navigation and electronics, installation requirements. Suppliers and use of catalogs.
15	Management and economics in boatbuilding	Relations with customer, design agreement, construction agreement. Design stages, construction stages. Cost evaluation – approach and samples. Certification of small craft for US, EU markets – rules and procedures.
16	CAD in small craft design (optional)	Use of software as useful tool in small craft design. Types of software – calculations, drafting, modeling, visualization. Design for CAM. Useful hints, common mistakes, difference between engineer and ‘software user’.