NAVAL ARCHITECTURE
Hull Form and Sailing Rig Design

Naval architecture is a related—but distinctly different—field of design compared to civil architecture and engineering. Boats must float, they are always in motion (sometimes violently so), they fly through both the water and the air, and there arc many unique forces and performance issues that must be addressed during design. Decks are both living spaces and parts of working machines, and space below is often at a premium, necessitating compact and innovative interior arrangements. Moreover, the principal units of form are curves, rather than straight lines, giving rise to a whole range of special problems in design and construction—and a world of form that, at its best, is achingly beautiful.

This Fall I will be again offering a small ‘Special Problems’ course, with two objectives in mind: The first is to involve a small group of dedicated students in an ongoing design and research project, the design of a 210-ton, two-masted wooden sail-training vessel based on a famous class of boats called North Sea Pilot Schooners. At this point, the schematic design is complete, and as we move into detailed development, the work will involve further studies of the detailed arrangement of the boat; refinement of hull form (considering both hydrodynamics and aesthetics); computer modeling of the hull using Rhino3d and the plug-in Ora 3D; fabrication of wooden half-models utilizing automated CNC technology; and rig and sail plan design. This is one of the most interesting phases of the design process, and we hope that this work will lead to subsequent hydrodynamic testing of scale models in a towing tank and aerodynamic testing of the rig in a twisted-flow wind tunnel. One of the research tasks involves a parametric study of a range of hull forms, and each student in the class will likely be modeling and analyzing a particular precedent.

The second objective is to provide a structured forum for students to study the fundamentals of naval architecture, including: • preliminary design and planning; • hull form, ship’s lines and ship’s geometry; • ship stability; • ship construction, with an emphasis on wooden boats; • hydrodynamics of ship’s hulls; • aerodynamics of sails and sailing vessels; • rig design and sail balance; and • various performance parameters.

This class will not be run like a typical subject elective with material presented in lecture format. Students must be self-motivated, and independent work will be expected. Background readings will be assigned and we will meet as a small working group in seminar format to discuss issues ranging from theory and engineering to design process and aesthetics. This class will be offered as a variable (2-4) credit class, and if taken for 4 credits, may count towards the department’s advanced technical elective requirement. Admission to the class is by instructor permission only. The class may have a formal component of instruction in Rhino3d.

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