



**European Master Course in  
“INTEGRATED ADVANCED SHIP DESIGN”**



**University of Genova  
Presentation of the third semester  
YACHT DESIGN (La Spezia Campus)**



**UNIVERSITY of GENOVA**



**EMship**  
*University of Genova  
Faculty of Engineering*



**Genova – Faculty of Engineering**  
Naval Architecture and Ship Construction



**Genova – Faculty of Architecture**  
Industrial Design for Pleasure Yachts



**La Spezia**  
**Faculty of Engineering – Faculty of Architecture**  
Pleasure Yacht Design



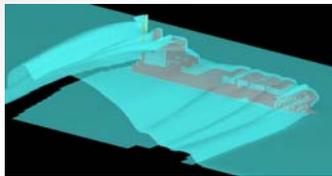
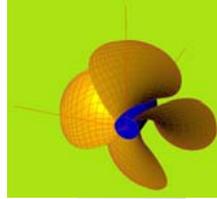
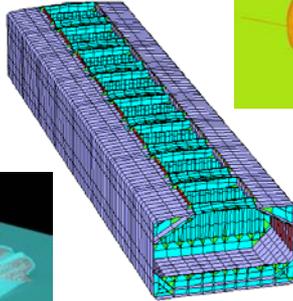
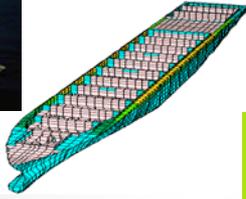
# UNIVERSITY of GENOVA



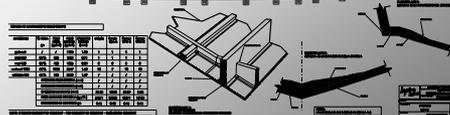
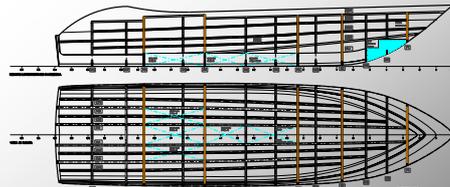
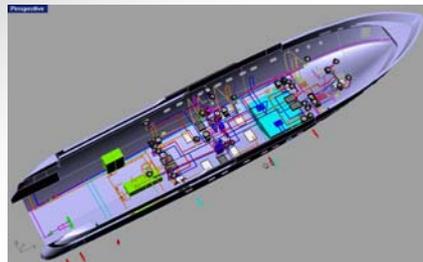
# CITY of LA SPEZIA

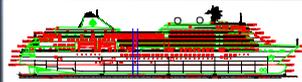


# Naval Architecture and Ship Construction



# Yacht Design





## YACHT DESIGN

### University of Genova – La Spezia

#### **MOTOR YACHTS DESIGN - Prof. MARCO FERRANDO**

##### **a) HYDRODYNAMICS**

Fast displacement hull forms (NPL, SSPA etc.), Planning hull forms: concepts and methods for power estimation (Savitsky theory), Rudder design for fast vessels, Propellers for fast craft: non cavitating, cavitating and surface piercing propellers, Arneson and LDU propulsive systems.

##### **b) MATERIALS AND STRUCTURE LAY OUT**

- **Materials:** Woods for ship construction and construction methods, Aluminum light alloys for ship construction, Composite materials characteristics, Sandwich materials, Methods of ship construction by composite materials.
- **Structure lay out:** Structure typology for wood, aluminum and composite hull

##### **c) RULES AND REGULATIONS**

Classification Societies Rules for motor yachts, MCA, Rules on maneuverability, Bulkheads subdivision, Motor Yacht's structure scantling main aspects.



### University of Genova – La Spezia

#### **SAILING YACHT DESIGN - Prof. Edward CANEPA**

##### **a) FUNDAMENTALS OF AERODYNAMICS AND HYDRODYNAMICS OF SAILING BOATS**

**Aerodynamics:** Lifting theory for thin profiles, Determination of sail coefficients, Laboratory tests, Numerical methods.

**Hydrodynamics:** Hull forms for sailing yachts, methods of power prediction for sailing yachts hulls, Systematic series for sailing yachts hulls (Gerritsma), Equilibrium of aero and hydrodynamic forces applied to sails and hull, Keel effect on sailing boat equilibrium, Keel design, VPP methods.

##### **b) HULL STRUCTURES**

- **Materials:** Wooden boat, Light Alloy hulls, Single skin composite boats, Modern sandwich technologies for yacht construction (vacuum, SCRIMP, infusion)
- **Structure lay out:** Structure typology for wood, aluminium and composite hull

##### **c) MAST AND RIGGING**

Definitions and nomenclature, Mast and rigging arrangement, Materials selection criteria and production methods, Loadings and methods of assessment,, Structural responses and methods.

##### **d) RULES AND REGULATIONS**

- Classification Societies Rules for sailing yachts, Germanischer Lloyd and Bureau Veritas Rules for hull, mast and rigging, appendages.



## INTERNSHIPS AND THESIS PROPOSAL

### **PERINI NAVI Shipyards Viareggio (Lucca)**



**One position is available for internship at Viareggio shipyards starting from July 16th 2012**

**The following two thesis are proposed:**

- **1st Title - Thermal analysis of light alloy hulls under severe temperature gradients.**
- **2nd Title - Propeller design for a new large sailing yacht (to be defined in detail).**



**BENETTI Shipyards**  
**Livorno**



**One position is available for internship at Livorno shipyards starting from July 16th 2012**

**Two thesis have been agreed upon:**

- **1st Title - FEM analysis of a 60m superyacht with particular attention to large opening effects.**
- **2nd Title - FEM analysis of a 60m superyacht with particular attention to the dynamic behaviour.**



**AZIMUT Shipyards**  
**Viareggio (Lucca) /Varazze (Savona)**



**One position is available for internship at Viareggio shipyards or Varazze technical offices, starting from July 16th 2012**

**Three thesis are proposed:**

- **Use of CFD techniques to improve the energetic efficiency of a hull form**



## INTERNSHIPS AND THESIS PROPOSAL

### Registro Italiano Navale La Spezia and Genova offices



**One position is available for internship at La Spezia or Genova offices, starting from July 16th 2012**

**Two theses are proposed:**

- **1st Title - Preliminary investigation on sailing yacht structural problems in view of a new set of Rules.**
- **2nd Title - Mechanical behaviour of composite materials in infusion techniques and relative implications in present rules.**



## INTERNSHIPS AND THESIS PROPOSAL

### Lloyd's Register Viareggio (Lucca)



**One position is available for internship at Viareggio offices, starting from July 16th 2012**

**Two theses are proposed:**

- **1st Title - Structural and fire implications in glass surfaces onboard superyachts**
- **2nd Title - Helicopter platform on superyachts: rules and regulations developments**



## INTERNSHIPS AND THESIS PROPOSAL

### INTERMARINE Shipyards

#### La Spezia



**One position is available for internship at La Spezia shipyards starting from July 16th 2012**

**The thesis title is to be defined according to the interests and necessities of the shipyard.**



## THESIS PROPOSAL

### University of Genova

#### La Spezia Campus



**One thesis is proposed:**

- **Seakeeping methodologies for the determination of super yacht design loads**

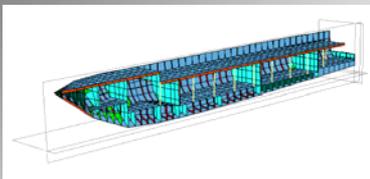
**A internship will be agreed with a shipyard in the proximity of La Spezia**



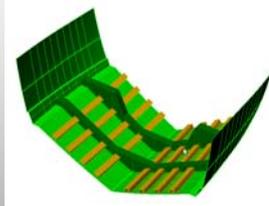
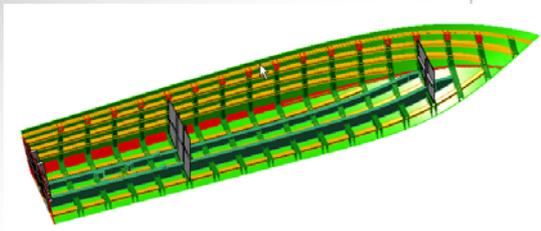
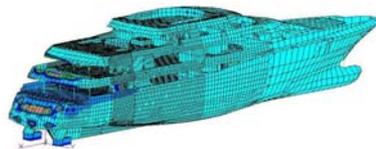
# UNIVERSITY of GENOVA and SHIPYARDS



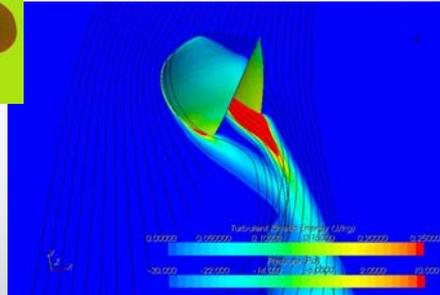
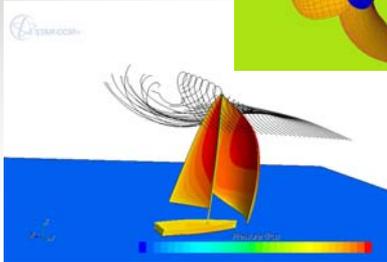
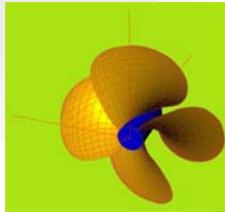
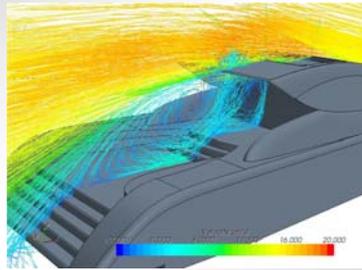
# Structural Analysis of Metal and GRP Yachts



MFC Plot: 2017-12-24 11:18:29  
Prage Detail Plot - 0.5E+06 Nodes, Translational (1) Component (NONLAYERED)



## CFD Analysis of Motor and Sailing Yachts

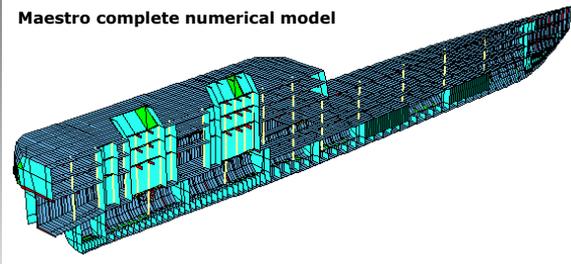


**A previous experience on the following softwares is useful:**

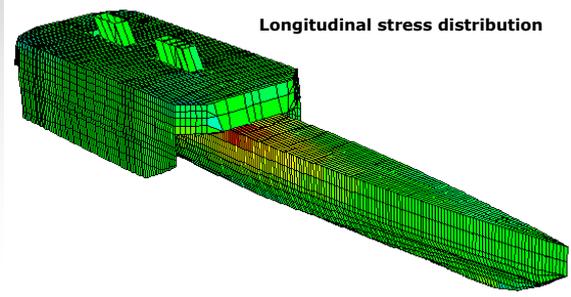
- **MICROSTATION**
- **RHINOCEROS**
- **NASTRAN (PATRAN)**
- **ANSYS**
- **STARCCD**



Maestro complete numerical model



Longitudinal stress distribution



Stress  $X_{(Y)}/mm^2$

267.678

237.678

207.677

177.676

147.675

117.675

87.674

57.673

27.672

-2.328

-32.329

-62.330

-92.331

-122.331

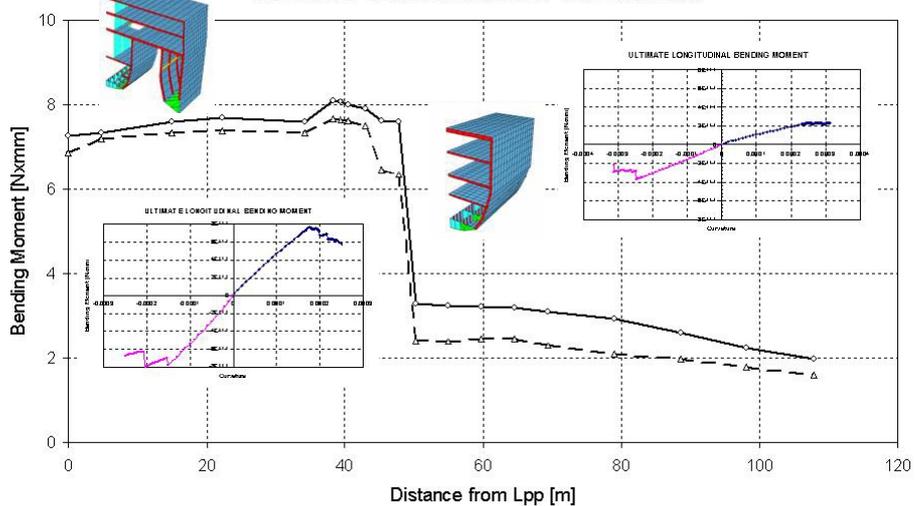
-152.332

-182.333

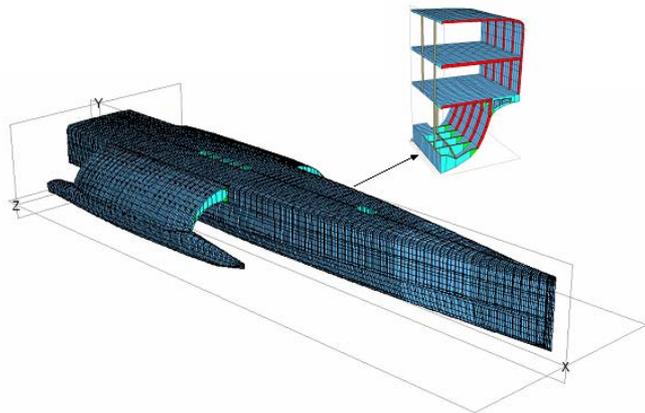
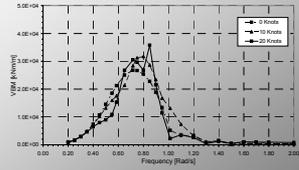
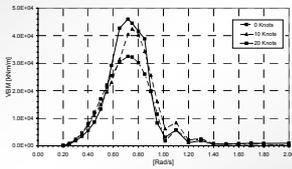
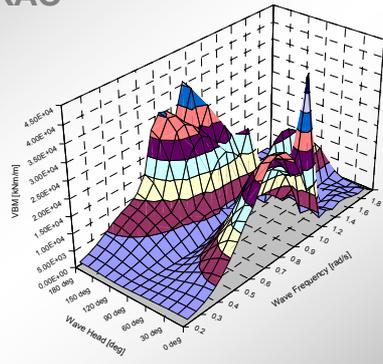
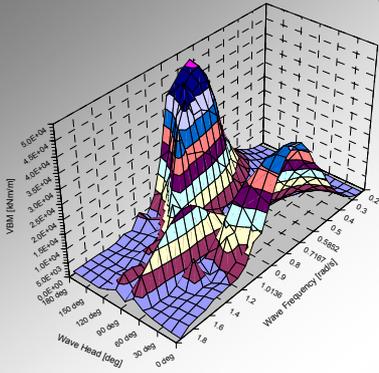
-212.334



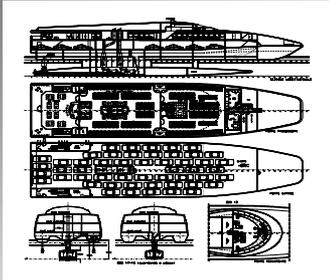
ULTIMATE BENDING MOMENT DISTRIBUTION



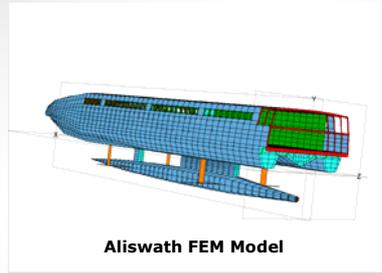
# VBM RAO



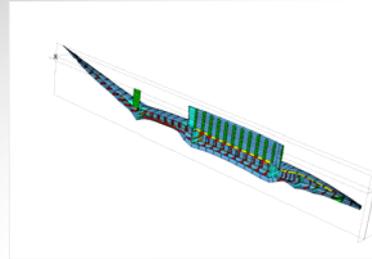
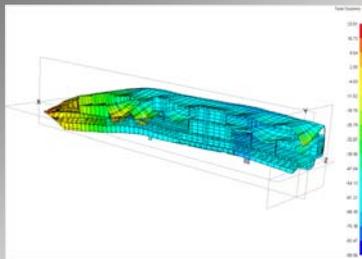
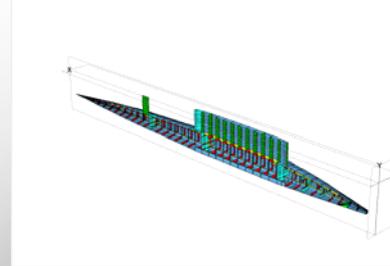
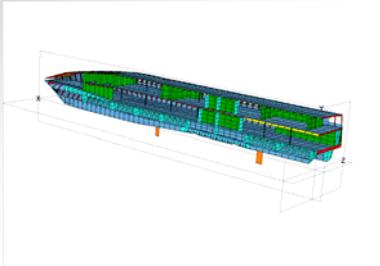
# Advanced Vessel Design



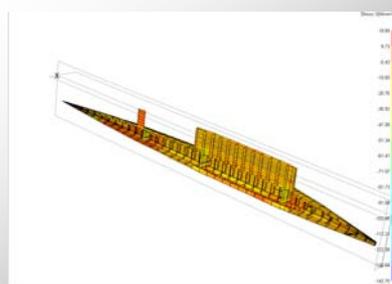
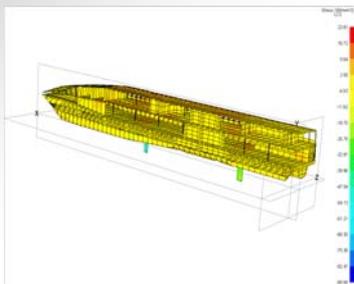
Structure layout of Aliswath

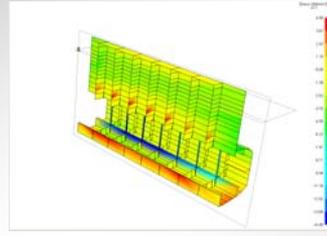
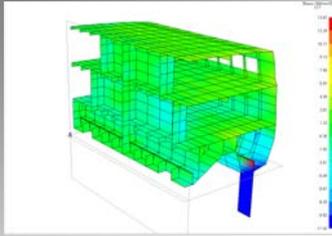


Aliswath FEM Model

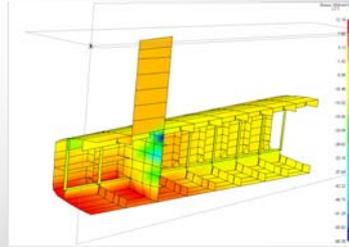
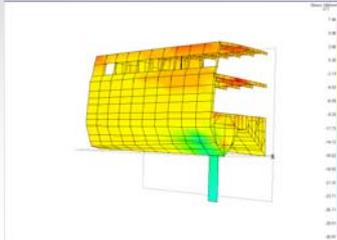


Displacements and Longitudinal stress distribution





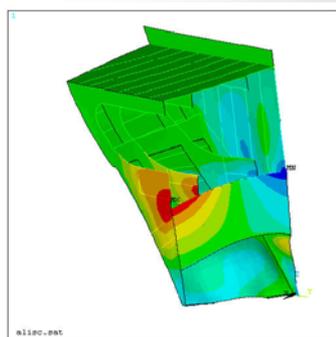
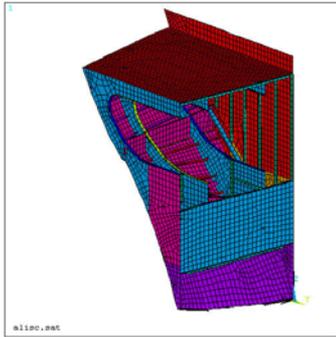
Longitudinal stress distribution



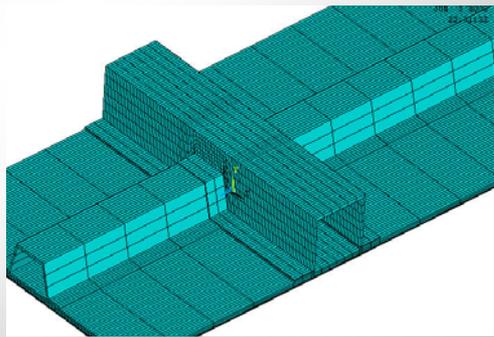
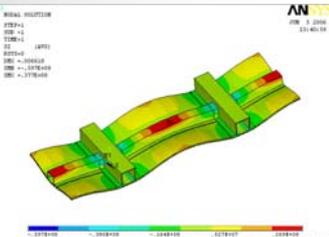
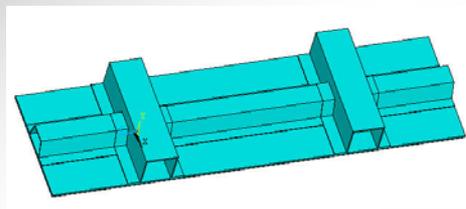
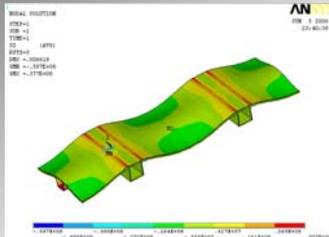
Some phases of the Aliswath construction in Rodriguez shipyards.



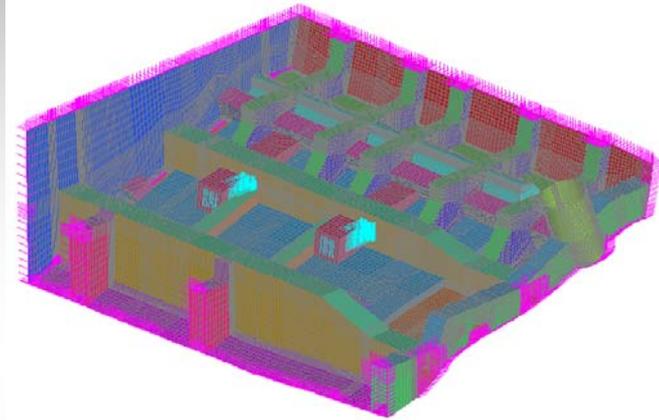
# Structural Analysis of an Hydrofoil



# Structural Analysis of GRP Motor Yachts



## FE MODEL to EVALUATE STRESSES on COMPOSITE LAMINATES of a 70' YACHT (ENGINE ROOM AREA)



## Structural and Fatigue Analysis of Offshore Platforms

