Fall 2015

# NAME 6168

Brandon Taravella
*University of New Orleans*

# NAME 6168
# HIGH SPEED HYDRODYNAMICS
# Elective (3 credits)

## CATALOG DESCRIPTION
The principal contributions to the foundations of planing theory are reviewed to elucidate the driving physics of the planing hydrodynamics process and as a demonstration of the practical potential of approaches to analysis of calm-water planing of general hard-chine hull forms. Planing boat sea keeping analysis is presented and applied to modern hull forms. Applications to catamarans, both calm water and seaway dynamics, is included via computational methods.

## PREREQUISITES
NAME 4160 – Ship Hydrodynamics II or Department Consent

## INSTRUCTOR
Brandon Taravella, PhD., P.E.
Associate Professor
504-280-6643
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EN 933
Office Hours: Tu/Th 9:30am to 11:30am, We 1:30pm to 3:30pm

## REFERENCES
Multiple published journal articles

## COURSE OBJECTIVES
- Provide a broad view by reviewing the applicable fundamental fluids boundary value problem and its reduction to the planing models.
- Acquaint students with the technology and terminology of modern planing hull forms within the context of applied theory.
- Effectively teach the use of the basic theory needed for rational design of general planing hulls.
- Emphasize the importance of the ability for original programming by homeworks requiring simple programming.

## CLASS SCHEDULE
This course meets two times a week, for 1.25 hour sessions each class:
Tu/Th 3:30-4:45 PM
EN 320

## GRADING
Assignments/Project – 70%
Final Exam - 30%

**COURSE TOPICS/JOURNAL REFERENCES**

I. Planing versus Displacement flow (discussion of differences)
II. Flow Types – attached (streamlined), separation, cavitation, ventilation (discussion)
III. The Ideal Flow Boundary Value Problem and Solution
IV. Hydrodynamic Modeling with Ideal Flow – sources, sinks, doublets, vortices
    a. Free-surface boundary condition
    b. Non-lifting versus lifting problems
V. High Aspect Ratio Approximation – Planar Hydrofoil
    a. 1st order planing
    b. Green's solution (non-linear)
VI. Low-Aspect Ratio Approximation (Planing)
    a. 0th order solution
       T. VonKarman, "The Impact on Seaplane Floats During Landing," NACA TN 321, Washington D.C., October 1929.
    b. 1st order solution
       Wagner, H., "Phenomenon Associated with Impacts and Sliding on Liquid Surfaces," *Zeitschrift fur Angewandte Mathematik und Mechanik,* Volume 12, August 1932.
    c. Tulin's solution
       M.P. Tulin, "The Theory of Slender Planing Surfaces at High Speeds," *Schiffstechnik,* Vol. 21, May 1957
    d. Vorus' solution
       W.S. Vorus, "A Flat Cylinder Theory for Vessel Impact and Steady Planing Resistance," *Journal of Ship Research,* Vol. 40, No. 2, June 1996
    e. Maruo's flat-ship theory (includes waves)
       H. Maruo, "High- and Low-Aspect Ratio Approximation of Planing Surfaces," *Schiffstechnik,* Vol. 72, May 1967
    f. General Solution to flat-ship theory (includes waves)
       B.M. Taravella and W.S. Vorus, "A General Solution to Low-Aspect-Ratio Flat-Ship Theory," *Journal of Engineering Mathematics,* On-line first, Nov. 2010
VII. Slender Body Theory (Semi-Planing)
     B.M. Taravella, W.S. Vorus and L. Birk, "A Hybrid Method for Predicting Lift and Drag on Semi-planing/Semi-displacement Hull Forms," FAST 2011, Honolulu, HI
VIII. Applications of the Low-Aspect Ratio Solution

**ACADEMIC INTEGRITY**

Academic integrity is fundamental to the process of learning and evaluating academic performance. Academic dishonesty will not be tolerated. Academic dishonesty includes, but is not limited to, the following: cheating, plagiarism, tampering with academic records and examinations, falsifying identity, and being an accessory to acts of academic dishonesty. Refer to the Student Code of Conduct for further information. The Code is available online at http://www.studentaffairs.uno.edu.

**STUDENTS WITH DISABILITIES**

It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities should contact the Office of Disability Services as well as their instructors to discuss their individual needs for accommodations. For more information, please go to http://www.ods.uno.edu.