



**COLLEGE OF ENGINEERING
AND COMPUTER SCIENCE**
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

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for the degree of Doctor of Philosophy (Ph.D.)

“Hydrodynamic Performance and Seakeeping Analysis of a Catamaran in Transforming Near-Shore Head and Following Seas”

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Virtual Dissertation

DEPARTMENT:

Ocean and Mechanical Engineering

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ABSTRACT OF DISSERTATION

Hydrodynamic Performance and Sea-keeping Analysis of a Catamaran in Transforming Near-Shore Head and Following Seas

The interaction of wind on water generates ocean waves. Ocean waves are formed by complex actions of resonance and shearing effects, in which the waves travel in various directions with different lengths, amplitudes, and periods. When the ocean waves form, they can travel vast distances, spreading in different directions by reducing their amplitude but preserving the wavelength and frequency. As the ocean waves approach the shoreline, the wave amplitude and wavelength begin altering due to the refraction and shoaling before the breaking phenomena. When the waves break, they travel through the surf zone. In the surf zone, complex transformation and attenuation processes occur, including the cross and long-shore current generation and the mean water level change. When a ship operates through the shoreline, the hull begins interacting with the waves that can lead to unknown motions. The physical phenomenon of wave transformation and the effect of wave-hull interaction on hydrodynamic performance is a complicated problem. This study aims to distinguish a catamaran’s hydrodynamic and seakeeping performance in an ocean environment through parametric numerical computations to uncover the physical phenomena. In this study, WAM-V 16 geometry is chosen as a vehicle of interest. The goal is to build a methodology for simulating an ocean wave environment and interactions with the vehicle. The thesis study uses OpenFOAM (Open-Field Operation and Manipulation) to generate non-linear ocean waves based on the wave theories in the literature and model the multiphase flow around the catamaran by using Volume of Fluid (VOF) Method. OpenFOAM is an open-source, object-oriented library written in C++ programming language for modeling complex physical problems in continuum mechanics. The multiphase flow around the ship including the six degrees-of-freedom (6DoF) motion problem is solved by “interFoam” solver, that enables the usage of dynamic mesh or overset mesh. The numerical results are validated through validation cases found in the literature and applied on the vehicle of interest.

BIOGRAPHICAL SKETCH

Born in Istanbul, Turkey

B.S., Yildiz Technical University, Istanbul, Turkey, 2013

M.S., Istanbul Technical University, Istanbul, Turkey, 2017

Ph.D., Florida Atlantic University, Boca Raton, Florida, 2022

**CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION**

Time in Preparation: 2018 - 2022

Qualifying Examination Passed: 2018

Published Papers:

“Hydrodynamic Performance of a Catamaran in Calm Water” MDPI, Journal of Marine Science and Engineering (Under Review)