COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Zao Ni

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

"Flow Control through Geometric Modifications to Improve Airfoil/Hydrofoil Performance"

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ABSTRACT OF DISSERTATION

Flow Control through Geometric Modifications to Improve Airfoil/Hydrofoil Performance

Geometric modification as the most effective passive flow control method has recently received wide attention due to its enormous potential in enhancing performance characteristics of airfoils or hydrofoils without expensive manufacturing and maintenance cost. Two primary passive flow control modifications, known as leading-edge tubercles and internal slots and their applications in airfoils/hydrofoils have been investigated in this dissertation. For the hydrofoil, since free surface effects cannot be neglected, the interaction between the hydrofoil-motion induced waves on the free surface and the hydrofoil has been studied as well. The experimental results confirm a new finding that for a submerged hydrofoil operating at high angles of attack close to a free surface, the interaction between the hydrofoil-motion induced waves on the free surface and the hydrofoil results in mitigation of the flow separation characteristics on the suction side of the foil and delay in stall, and improvement in hydrofoil performance.

BIOGRAPHICAL SKETCH
Born in Zhengzhou, Henan - China
B.S., Jilin University, Changchun, Jilin, China, 2005
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CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION

Time in Preparation: 2017 - 2019

Qualifying Examination Passed: Fall 2016

Published Papers:

- Ni, Z., and Su T. C., and Dhanak M., (2018): An empirically-based model for the lift coefficients of twisted airfoils with leading-edge tubercles. AIP Advances, 8, 045123.
- Ni, Z., and Dhanak M., and Su T. C., (2019): Performance characteristics of airfoils with leading-edge tubercles and an internal slot. AIAA Journal. (Accepted)
- Ni, Z., and Dhanak M., and Su T. C., (2019): Improved performance of a slotted blade using a novel slot design. Journal of Wind Engineering & Industrial Aerodynamics. (revision under review)
- Ni, Z., and Dhanak M., and Su T. C., (2019): Performance of a hydrofoil operating close to a free surface over a range of angles of attack Part I: Performance characteristics of a conventional foil. Ocean Engineering. (under review)
- Ni, Z., and Dhanak M., and Su T. C., (2019): Performance of a hydrofoil operating close to a free surface over a range of angles of attack Part II: Performance characteristics of a slotted foil. Ocean Engineering. (under review)