



# SPCEET RESEARCH SEMINAR SERIES

## Dr. Joe Majdalani

Joe Majdalani, Francis Chair and Professor of Aerospace Engineering at Auburn University, has been a pioneering researcher in aerodynamics and rocket propulsion for more than 30 years. He is a prolific scholar and exemplary mentor who has been invited to present more than 100 seminars and plenaries worldwide. He has over 330 publications and around 20,000 citations. As a well-recognized authority in the field, he has co-authored a leading McGraw-Hill textbook titled, *Viscous Fluid Flow*, 4th edition, and delivered the 2023 Von Kármán Lecture. He has advanced new formulations based on Kármán's approach and organized a Special Collection in the *Physics of Fluids* titled, "Centennial of the Kármán-Pohlhausen Momentum-Integral Approach."

For his teaching and mentorship activities, Professor Majdalani has attracted several noteworthy distinctions and awards both locally and internationally.

## CELEBRATING THE CENTENNIAL OF VON KÁRMÁN'S MOMENTUM-INTEGRAL APPROACH

We celebrate the centennial of the momentum-integral approach, one of the most significant theoretical contributions of Theodore von Kármán, which is widely taught in the field of aerodynamics. After giving tribute to von Kármán, we discuss the broad impact of his approach, which dates back to 1921, and is often used in conjunction with Pohlhausen's polynomial approximations. We then offer a compelling rational explanation for the long-standing Pohlhausen paradox, namely, the reason why higher-order polynomial approximations of the nearfield produce less accurate predictions of the skin friction coefficient and boundary-layer thickness than lower-order Pohlhausen polynomials. Not only do we clarify the root cause of the Pohlhausen paradox, we provide alternative solutions that enable us to extend the accuracy of the momentum-integral approach by two orders of magnitude. Lastly, we provide an essentially exact one-term solution to the widely cited Blasius equation, whose analytical treatment has eluded scientists since its inception in 1907.

**Date:**

Wednesday, April 24th

**Time:**

11:15AM - 12:15 PM

**Location:**

Q-314