College of Engineering
Department of
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The Robert W. Courter Seminar Series

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ZOOM: https://lsu.zoom.us/meeting/register/tJApd-mhqzssHNAtbx8xlujIXfCf28JLgcJB

Multiphysics Modeling and Simulation of Complex Thermo-Fluid Systems

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Simulation of complex thermo-fluid systems requires treatment of multiscale physics that are not currently modeled with sufficient accuracy. This is regardless of the significant advances in computational power that has evolved over time. Although there are a variety of contributing factors, there are four core challenges that must be addressed to move beyond the current state of the art. First, the nonlinear interdependence between multiscale-multiphysics interactions must be quantified with a much higher level of accuracy. Second, potential inconsistencies with existing simulation techniques and the related assumptions need to be identified and corrected. Third, the relationship between numerically resolved processes and fine-scale multiphysics that are modeled needs to be established with a much higher level of precision. Fourth, research aimed at addressing the challenges above must be performed at device relevant conditions that are truly representative of the dynamic systems of interest. This presentation will highlight recent observations, challenges, and progress in this regard with emphasis on the Large Eddy Simulation (LES) technique.

* Dr. Oefelein is a Professor in the Guggenheim School of Aerospace Engineering at the Georgia Institute of Technology. Prior to this he was employed as a Distinguished Member of Technical Staff at Sandia National Laboratories, Combustion Research Facility (2000 – 2017), and a Research Associate in the Department of Mechanical Engineering at Stanford University (1997 – 2000). He received a Ph.D. in Mechanical Engineering from Penn State University in 1997. His research interests are interdisciplinary, with focus on the theory, numerical modeling, and analysis of complex fluid flows where turbulence interacts with a multitude of strongly coupled fluid dynamic, thermodynamic, transport, chemical, multiphase, and heat transfer processes. Concurrent interests are focused on computational fluid dynamics and massively-parallel high-performance computing with emphasis on the large-eddy-simulation and direct-numerical-simulation techniques. Dr. Oefelein is a Fellow of The Combustion Institute and the American Society of Mechanical Engineers (ASME), an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA), and active in the American Physical Society (APS), and Society of Automotive Engineers (SAE). He serves on the Editorial Board of The Combustion Institute and is an Editor for the Proceedings of The Combustion Institute. He is an Associate Editor for the Journal of Propulsion and Power and a member and past Chair of the AIAA Propellants and Combustion Technical Committee .