Track 10: Fluid Mechanics Fundamentals

Sponsors: Fluids Engineering Division

Topic 10-1: Boundary Layer Flows (FMTC)

Organizers:
Deify Law: dlaw@csufresno.edu
Bei Fan: fanbei1@msu.edu

Descriptions:
The Boundary Layer Flows topic invites contributions on various aspects of laminar and turbulent boundary layer flows. Relevant areas include exact and numerical solutions, thermal boundary layers, and boundary layer control techniques. The topic also covers unsteady boundary layers, laminar-turbulent transition, and free shear flows with their applications. Additional focus is given to supersonic boundary layers, shock-wave boundary layer interactions, and advanced numerical methods for boundary layer analysis. This session aims to explore both theoretical and practical aspects of boundary layer dynamics across a range of flow conditions and applications.

Topic 10-2: High-Speed Flows (FMTC)

Organizers:
S.A. Sherif: sasherif@ufl.edu
Marianne Francois: mmfran@lanl.gov

Descriptions:
The High-Speed Flows topic invites contributions on various aspects of high-speed aerodynamics and shock physics. Topics of interest include high-speed wind tunnel testing, compressible flow dynamics, and both external and internal aerodynamics. Additionally, the session seeks studies on drag reduction techniques, aerodynamic heating, supersonic boundary layers, supersonic combustion, such as in ramjets, and detonation and deflagration. Contributions on hypersonics vehicles, shock-wave boundary layer interactions, and advanced numerical methods for analyzing high-speed flows are also welcome. We aim to address challenges and advancements in the study of high-speed flows, fostering innovation in this critical area.

Topic 10-3: Turbulent Flows (FMTC)

Organizers:
Jun Chen: junchen@purdue.edu
Bei Fan: fanbei1@msu.edu

Descriptions:
The Turbulent Flows topic focuses on advancing the understanding and control of turbulent flows across various application domains. Contributions may include experimental, numerical, or theoretical studies where turbulence significantly impacts momentum, heat, and mass transfer. Relevant topics include the stability of turbulent flows, numerical modeling using RANS, LES, or DNS, flows influenced by body forces such as electromagnetic fields or rotation, drag reduction, jet flows, confined flows, and unsteady flows with or without heat and mass transfer. Original research contribution using both experimental and

computational approaches are welcome. This topic offers flexibility in presentation topics, ensuring a wide range of quality-driven discussions.

Topic 10-4: Vortex Dynamics (FMTC)

Organizers:
S.A. Sherif: sasherif@ufl.edu
Bei Fan: fanbei1@msu.edu

Descriptions:
The Vortex Dynamics topic offers comprehensive coverage of current experimental, analytical, and numerical research on vortex flows. Key areas include vortex flow physics, instabilities, and turbulence, as well as vortex creation and annihilation. The topic also encompasses studies on cyclones, phase changes in vortex flows, Lee vortices, vortex shedding, shallow-water vortices, vertical vorticity, spiral vortex flows, and ring vortices. Contributions related to the experimental, analytical, and numerical methods used to study these phenomena are encouraged. We aim to highlight advancements and foster discussions across all aspects of vortex dynamics.

Topic 10-5: Non-Newtonian Fluid Flows (CFDTC)

Organizers:
Garman, Mohamed: mohamed.garman@ksb.com
Bei Fan: fanbei1@msu.edu

Descriptions:
This topic will explore flow and heat transfer behavior in non-Newtonian fluids fundamentals and applications. CFD, experimental and theoretical research are all welcomed.

Topic 10-6: Interfacial Phenomena & Flows (MFTC)

Organizers:
Yue (Stanley) Ling: Stanley_ling@sc.edu
Tom Shepard: thomas.shepard@stthomas.edu

Descriptions:
Interfacial flows represent one of the most challenging and dynamic areas in fluid dynamics due to the intricate interplay between different phases and the diverse scales involved. Understanding these processes is crucial for optimizing systems where multiphase flows are prevalent. This forum offers a platform for the fluids engineering community to present and discuss the latest experimental, numerical, and theoretical advancements critical to various engineering and scientific applications involving interfacial phenomena. Topics covered include: Capillary waves and instability mechanisms; Drop and bubble formation, breakup, and coalescence; Wetting, spreading, and contact line dynamics on solid surfaces; Heat and mass transfer, phase change, and interfacial reactions; Marangoni flows driven by temperature gradients and surfactants; Interfacial instability and interface-turbulence interactions.