Other - Enabling Process Innovation through Computation (EPIC) Seminar Series

Particulate Flow Across Multi-scales: Numerical Strategies for Momentum, Heat and Mass Transfer

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Professor

Patrick Taylor Hall 1502
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Abstract:

Particulate flows are ubiquitous in environmental, geophysical and engineering processes. The intricate dynamics of these two-phase flows is governed by the momentum transfer between the continuous fluid phase and the dispersed particulate phase. When significant temperature differences exist between the fluid and particles and/or chemical reactions take place at the fluid/particle interfaces, the phases also exchange heat and/or mass, respectively. While some multi-phase processes may be successfully modelled at the continuum scale through closure approximations, an increasing number of applications require resolution across scales, e.g. dense suspensions, fluidized beds. Within a multi- scale micro/meso/macro-framework, we develop robust numerical models at the micro and meso-scales, based on a Distributed Lagrange Multiplier/Fictitious Domain method and a two-way Euler/Lagrange method, respectively. Particles, assumed to be of finite size, potentially collide with each other and these collisions are modeled with a Discrete Element Method. We discuss the mathematical issues related to modeling this type of flows and present the main numerical and computational features of our simulation methods. We also illustrate what can be gained from massively parallel computations performed with our numerical code PeliGRIFF, in terms of physical insight into both fundamental questions and applications from the chemical engineering and process industry. Finally, we explain how knowledge gained at the micro scale can cascade upwards and contribute to the development of enhanced meso and macro-scale models.

Attend online at: HTTP://LSU.WEBEX.COM/MEET/NANDAKUMAR

Speaker's Bio:

Anthony Wachs received in BS & MS from the University Louis Pasteur of Strasbourg and his PhD from the Institut National Polytechnique of Grenoble in 2000. Right after, he was hired in 2001 as a Fluid Mechanics research engineer at IFP Energies nouvelles (IFPEN, at that time Institut Français du Pétrole) in Paris. In 2010, he moved to IFPEN-Lyon, get his HDR (French Habilitation to Supervise Research) and was later promoted Scientific Advisor in Multiphase Flows and Scientific Computing. From 2010 to 2015, he supervised a group of researchers (including PhD & post-doc students) on the numerical simulation of reactive particulate flows (www.peligriff.com). His main research interests are non-Newtonian Flows, Multiphase Flows and High Performance Computing. He recently moved to the University of British Columbia as a professor in both the CHBE and Math Departments.

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