College of Engineering
Department of
Mechanical & Industrial Engineering

The Robert W. Courter Seminar Series

3:00-4:00pm, Friday, February 13, 2026

1253 Patrick F. Taylor Hall

30 years of sailing the seas of simulation

by Dr. Tariq Aslam

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Abstract: This work presents an overview of advanced numerical methods aimed at enhancing the efficiency and accuracy of simulations. Specifically, three classes of solvers are discussed: (1) Runge–Kutta–Legendre (RKL) and Runge–Kutta–Gegenbauer (RKG) super-time-stepping schemes for efficient explicit time integration of parabolic or mixed parabolic–hyperbolic partial differential equations; (2) fast sweeping methods for hyperbolic equations; and (3) efficient implementations of level set methods for tracking many materials or regions. Together, these techniques form a highly efficient and scalable computational toolkit for high-fidelity modeling of complex physical systems. The talk will overview key algorithmic developments, theoretical foundations, and practical applications of these methods, emphasizing their relevance in multiphysics environments such as fluid dynamics, combustion, and materials science.

Biography: *Tariq Aslam, of the Physics and Chemistry of Materials group, began his career at Los Alamos National Laboratory as a graduate student 30+ years ago after receiving his B.S. in Mechanical Engineering from the University of Notre Dame and M.S. and PhD in Theoretical and Applied Mechanics from the University of Illinois. Since then, he has become a leader in high-explosives detonation modeling and algorithm development. In particular, he has been instrumental to detonation shock dynamics modeling, reactive flow development with an eye toward bridging experimental design, algorithmic and model development, verification and validation. He has published papers spanning detonation theory and modeling, shock physics and development of computational algorithms.*

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