# MICDE-NERS-MIPSE Seminar

## Brian Haines

Los Alamos National Laboratory

### Radiation-hydrodynamics modeling & application to prediction of Inertial confinement fusion experiments

**3:00 PM**

**Tuesday, Feb. 10, 2026**

**Johnson Rooms**
**Lurie Eng. Cent.**
**1221 Beal Ave.**

**More information**

The xRAGE radiation-hydrodynamics code is a state-of-the art simulation tool for modeling inertial confinement fusion experiments. xRAGE is one of only three radiation-hydrodynamics codes developed in the U.S. with sufficient physics to credibly model both capsule implosions as well as the high-Z cylindrical hohlraums used to convert laser energy into an X-ray drive for the capsule. xRAGE solves the equations for hydrodynamics and other physics in an Eulerian reference frame and features adaptive mesh refinement, which makes it uniquely well-suited to accurately modeling capsule defects and engineering features that are important factors limiting capsule performance. In the first half of this talk, we will discuss the physics modeling capabilities and algorithms available in xRAGE with an emphasis on those relevant to high-energy-density physics and inertial confinement fusion. In the second half of the talk, we will discuss the successful application of xRAGE to provide pre-shot predictions for seventeen high-yield capsule implosions on the National Ignition Facility. This will include the modeling methodology, how we establish prediction uncertainties, and how we have learned from prediction failures to improve the methodology. Our predictions have exhibited a 67% success rate thus far, which is much higher than other pre-shot predictions over the same set of experiments.

Brian M. Haines is a Senior Distinguished Scientist in the Eulerian Codes group in the X-Computational Physics division at Los Alamos National Laboratory. He leads the Ignition Applications project, including the THOR and BrassOwl campaigns, and directs LANL's xRAGE pre-shot predictions and post-shot analysis for high-yield implosion experiments at the National Ignition Facility. He led the decadal effort to develop the xRAGE radiation-hydrodynamics code into a state-of-the-art tool for inertial confinement fusion and high-energy-density physics and pioneered large-scale, high-resolution, full-physics 3D simulations of ICF implosions.

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