**SCALE Sensitivity and Uncertainty Analysis for Criticality Safety Assessment and Validation**

Sensitivity and uncertainty analysis methods provide advanced techniques for code and data validation including the identification of appropriate experiments, detailed quantification of bias and bias uncertainty, identification of gaps in available experiments, and the design of new experiments. The Sampler sequence within SCALE provides a flexible tool for quantifying uncertainties due to manufacturing tolerances as well as composition and dimensional uncertainties in criticality safety assessments. This 5-day training class provides a foundation on sensitivity and uncertainty analysis and applies these methods to criticality safety validation applications, as well as instruction on the use of Sampler for uncertainty quantification. Topics covered include:

- The TSUNAMI sensitivity and uncertainty analysis techniques for determining the sensitivity of the k-eff eigenvalue to cross section uncertainties using both multigroup and continuous-energy physics.
- SCALE’s comprehensive cross section covariance data library, which is applied to these sensitivity coefficients to estimate the data-induced uncertainty in k-eff.
- The TSUNAMI-IP code, which determines the correlation between benchmark and application systems in terms of their shared sources of data-induced uncertainty.
- The USLSTATS trending analysis tool, which uses similarity coefficients from TSUNAMI-IP (among other parameters) to estimate the computational bias and bias uncertainty for design and licensing applications.
- The TSURFER data adjustment tool, which uses generalized linear least squares to adjust nuclear data parameters to minimize discrepancies between computed predictions and the results of integral experiments; these adjustments can then be used to estimate bias and bias uncertainty in design and licensing applications.
- The SAMPLER code for uncertainty assessment, which randomly samples nuclear data and/or system compositions and dimensions to quantify the uncertainty in system k-eff.

This course will cover the theoretical basis for these analysis techniques and will also conduct exercises for attendees to familiarize themselves with these tools. It is recommended that attendees are familiar with the KENO Monte Carlo code or are experienced SCALE users, although these are not necessary prerequisites.