OAK RIDGE National Laboratory

AGENDA

MANAGED BY UT-BATTELLE LLC FOR THE US DEPARTMENT OF ENERGY

SCALE Training: Criticality Safety and Radiation Shielding

Oak Ridge National Laboratory

Training summary:
This course provides instruction on the use of the CSAS6 sequence for criticality safety calculations and the MAVRIC shielding sequence with 3D automated variance reduction for deep-penetration problems.

Participants will learn how to use 3D Monte Carlo methods and other associated SCALE products to calculate k_{eff}, particle flux, and dose rates of various applications by defining and applying:

- geometry of a 3D model,
- materials via the compositions,
- cross section treatments,
- model parameters,
- tally definitions,
- source distributions,
- variance reduction methods.

Both CSAS6 and MAVRIC can use ENDF/B-VII.1 or ENDF/B-VIII.0 nuclear data distributed with SCALE to perform continuous energy (CE) or multigroup (MG) calculations. Both sequences can also be used with the Fulcrum consolidated SCALE user interface for interactive model setup, computation, output review, and 3-D visualization.

Note:
This training will be taught with SCALE 6.3. No prior knowledge of SCALE is required.

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Day 1

CSAS6 Basics
Welcome, Introductions, Logistics, Course Objectives
Overview of SCALE
Introduction to CSAS6
Composition Inputs: Basic Standard Compositions & Workshop
Composition Inputs: Atom and Weight Percent Mixtures & Workshop
Composition Inputs: Solutions & Workshop
KENO-VI Geometry
Class Exercise: Lady Godiva
Introduction to Monte Carlo and Uncertainties
How to Run SCALE
Problem Set K6.1: Green Block and Rocky Flats

Day 2

KENO-VI geometry in-depth
Geometry Modification Data
Class Exercise: Y30
Problem Set K6.2 (Hopper and Cross)
Contents: Holes

Contents: Arrays
Problem Set K6.3 (Pins in a tank, 4A-4M) with Break
Resonance Self-Shielding/Unit Cell Data & Exercises

Day 3

KENO-VI Parameters
KENO Parameter and Other Data
Problem Set K6.4 (Annular hex array, Goslar, or Castor)
Review KENO-VI
MAVRIC Basics
Monte Carlo and MAVRIC Basics
In-Class Example – Iron Sphere Benchmark
Exercise 1 – Neutron Howitzer
Retrospective Day 3

Day 4

CADIS
Exercise 2 – Graphite Shielding Measurements
Graphite Shielding Measurements
Advanced Variance Reduction with CADIS
In-Class Example – Dose Rates Near a Shipping Cask
Exercise 3 – Graphite Shielding Measurements Revisited

FW-CADIS and CAAS
Forward-Weighted CADIS (FW-CADIS)
Exercise 4 – Storage Cask Farm
CAAS Capability with KENO-VI and MAVRIC
Exercise 5 – Jezebel and CAAS in a Block Building
Retrospective Day 4

Day 5

CAAS Exercise and Review
Exercise 5 – Jezebel and CAAS in a Block Building
Course Review and the Future
Conclusion ○ Review & Feedback ○ Certificates ○ Q&A