

MC146 Probabilistic and Uncertainty Quantification Methods for Model Verification & Validation

Day 1

- Background
 - Verification and validation
 - Validation metrics
 - Validation requirements
 - Predictions
 - Decisions

- Modeling uncertain variables
 - Mathematical models for uncertainty (PDF/CDF)
 - Data fitting

- Propagating uncertainties
 - Sampling methods
 - Analytical methods

- Formulating UQ problems
 - Solution objectives
 - Defining the model
 - Modeling random variables
 - Evaluating results

- Sensitivity analysis
 - Deterministic
 - Probabilistic
 - Global

Day 2

- UQ for numerical models
 - Uncertain variables related to finite element
 - Modeling spatial and temporal variables
 - Solution approaches

- Response surface models for efficient uncertainty propagation
 - Basic principles
 - Training data bounds/# points in practice



- Polynomial model fitting
 - Gaussian process concepts
 - Model assessment

- Bayesian statistics for uncertainty quantification
 - Identification and categorization of different types of uncertainty
 - Modeling/quantification of uncertainty
 - Bayesian analysis

- Model Parameter Calibration
 - Concepts
 - Bayesian analysis for model calibration
 - Evaluation of calibration assumptions

- UQ solution strategy examples
 - Turbine blade model overview
 - Model and data uncertainties
 - Solution strategies
 - Results interpretation