

# SENG 430—RISK ANALYSIS IN SAFETY ENGINEERING

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**Textbooks:** Charles E. Ebeling, *An Introduction to Reliability and Maintainability Engineering*, 2nd ed., Waveland Press, Inc. (2010) (ISBN-10 1577666259)  
Norman Fenton and Martin Neil, *Risk Assessment and Decision Analysis with Bayesian Networks*, CRC Press (September 24, 2012) (ISBN-10 1439809100)

**Description:** This course provides the opportunity to learn about risk, the applications of risk involved with industrial activities, and how to practice risk-informed decision-making and risk management. Because engineering is a decision-making enterprise, a decision-making way of thinking is used throughout the course.

## Topics:

- Introduction—hazards, risk, risk analysis, probability, reliability
- Risk Assessment (RA) methods
  - RA structure
  - Decision analysis, value of information, value of control
  - Probability modeling of uncertain events for optimum decision-making and Bayes model for probability
  - Near misses, unusual occurrences, precursor events
  - Logic modeling, fault trees, event trees, Bayesian networks
  - Dependent failures— $\beta$ -model of common cause failure
- Performance assessment
  - Equipment data analysis, availability
  - Distribution function parameter estimations
  - Human reliability
- Uncertainty analysis
  - Uncertainty propagation methods and comparisons
- Consequence analysis
  - Aloha, Phast, Probit, Multi-Energy, Baker-Strehlow models
- Risk contributors
  - Risk metrics, risk ranking
- Risk values, risk acceptance criteria
  - Individual and society criteria, ethics, citizen engineer
- Risk management
  - Risk-informed multi-criteria decisions and management
- Risk communication and safety culture
  - Risk perception, risk conversion factors

## Objectives:

- Learn how to perform risk assessment.
- Reduce risk within acceptable levels.
- Manage risk.
- Improve system risk and reliability.
- Make risk/gain informed decisions to benefit the organization and the community.
- Communicate decisions that affect the public, which benefits from and supports the products of your company.

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| 4.2<br>CEUs | 42<br>PDHs |
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