CE 464 – Decision and Risk Analysis

Code and Name: CE 464 – Decision and Risk Analysis

Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:

- Risk Management for Design and Construction, Ovidiu Cretu, Terry Berends, and Robert B. Stewart, 1st Edition, Wiley, 2011

Other References:

- Managing Risk in Construction Projects, Nigel J. Smith, Tony Merna, Paul Jobling, 3rd Edition, Wiley, 2014

Course Description:

Basic notions of set theory and probability: Sample space and events; conditional probability; statistical independence, total probability; Bayes theorem. Random variables: univariate and multivariate distributions, expectation, moments. Probabilistic models for engineering analysis: Bernoulli sequence, binomial distribution, Poisson and related distributions, Normal and related distributions, Extreme-value distributions, Other distributions used in statistics. Introduction to decision theory: Basic notions of utility theory, Decision tree, Terminal analysis, Pre-posterior analysis, Decision problems in estimation.

Pre-requisites: CE461 Construction Engineering and Management

Co-requisites: None

Course Learning Outcomes:

With relation to ABET Student Outcomes (From Fall 2019-SOs: 1-7)

1. To recognize ethical and professional responsibilities in decision and risk analysis related to codes and standards, the semester project, and response to issues in the course. (4)
2. To identify, formulate, and solve complex engineering problems in decision and risk analysis related to uncertainty, risks, decision-making, risk identification, risk analysis, risk response, risk monitoring and control and risk management systems. (1)
3. To analyze and apply decision and risk analysis, risk planning, Monte Carlo simulation. (2)
4. Demonstrate communication skills in both oral and written during the semester project presentation (3)
5. To acquire and apply new knowledge with emphasis on decision and risk analysis, risk planning, Monte Carlo simulation and their application. (7)

Topics to be covered:

- Basic notions of set theory and probability: Sample space and events; conditional probability; statistical independence, total probability; Bayes theorem.
- Random variables: univariate and multivariate distributions, expectation, moments.
- Probabilistic models for engineering analysis: Bernoulli sequence, binomial distribution
- Poisson and related distributions, Normal and related distributions, Extreme-value distributions, Other distributions used in statistics,
- Statistical inference: Point and interval estimation, Maximum likelihood estimation, Bayesian estimation and updating, Conjugate distributions
- Introduction to decision theory: Basic notions of utility theory.
- Decision tree, Terminal analysis, Pre-posterior analysis.
- Decision problems in estimation.

Grading Policy:

The grading for the course is: 60% coursework and 40% Final Exam. The course work consists of two Midterm Exams, where each midterm exam is worth 20%. The remaining 20% includes quizzes, and projects that course instructor can modify.