



**GEO-  
INSTITUTE**  
**Pittsburgh Chapter**



# Quantitative Risk Assessment in Geotechnical Engineering: Course Outline

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## Introduction to Risk Assessment in Geotechnical Engineering

- ▶ Motivation for this course
- ▶ Fundamentals of loads and resistance
- ▶ Basic probability theory
- ▶ Set theory
- ▶ Conditional probability and total probability theorem
- ▶ Bayes' Theorem

## Introduction to Random Variables

- ▶ Discrete and continuous random variables
- ▶ Common probability density functions
- ▶ Use of random variables
- ▶ Means and variances
- ▶ Covariance and correlation
- ▶ Examples of bearing capacity and slope stability



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## Simple Tools for Probabilistic Analysis (1)

- ▶ Rules for nonlinear functions in geotechnical engineering
- ▶ The First Order Second Moment (FOSM) Method
- ▶ Invariance problems with FOSM
- ▶ The First Order Reliability Method (FORM)

## Simple Tools for Probabilistic Analysis (2)

- ▶ The First Order Reliability Method (Continued)
- ▶ Monte-Carlo (M-C) Methods
- ▶ Using Single Random Variables (SRV)
- ▶ Earth pressure, foundations, and slope stability examples

## More Advanced Tools for Probabilistic Analysis

- ▶ Random Fields and the Random Finite Element Method (RFEM)

