

Course Announcement: Fall 2023

Risk Assessment in Geotechnical Engineering CEEN 419/519

3 Hours Credit

Time: TR 9:30-10:45, Room: CO 219

Instructor: D.V. Griffiths

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Soil and rock are among the most variable of all engineering materials, and as such are highly amenable to a probabilistic treatment. Assessment of the probability of failure or inadequate performance is rapidly gaining ground on the traditional factor of safety approach as a more rational approach to design decision making and risk management. Probabilistic concepts are also closely related to system reliability and Load and Resistance Factor Design (LRFD). When probability is combined with consequences of failure, this leads to the concept of risk. This course is about the theory and application of various tools enabling risk assessment in engineering with an emphasis on geotechnical applications.

a Overview of Risk Assessment in Engineering.

b Review of Probability Theory. Basic probability concepts, Mathematics of probability, Bayes' theorem

c Random Variables. Probability distributions, Moments, Covariance and correlation, Discrete and continuous distributions.

d Reliability Engineering. Component and system reliability, Total probability, Event trees, Reliability based design.

e Functions of Random Variables. Single RV, two or more RVs. Moments of functions.

f Calculation Methods First Order Second Moment (FOSM), First Order Reliability Method (FORM), Monte-Carlo Methods.

g Best Linear Unbiased Estimation Estimator error.

Course textbook:

There is no required text for this course although the following will serve as useful references and are available for short loan at the Lakes Library:

Risk Assessment in Geotechnical Engineering,
G.A. Fenton and D.V. Griffiths,
John Wiley and Sons Inc, Hoboken, NJ, 2008
(On-line version available)

Probability Concepts in Civil Engineering,
A.H-S. Ang and W.H. Tang,
2nd ed., John Wiley and Sons Inc, Hoboken, NJ, 2007

Reliability and Statistics in Geotechnical Engineering,
G.B. Baecher and J.T. Christian,
John Wiley and Sons Ltd, Chichester, UK, 2003

Assessment

Coursework	25 %	
1st exam	37.5 %	TBA
2nd exam	37.5 %	TBA

Grading

A	B	C	D	F
$\geq 90\%$	$\geq 80\%$	$\geq 70\%$	$\geq 60\%$	$< 60\%$

- Homework will be due one week after being assigned (no late submissions).
- Two questions from each homework assignment will be chosen for grading. 500-level students will have one additional assignment.
- All homework must be word-processed.
- All exams are open-book, open-notes.
- No make-up exams unless required by the Registrar.