



## PROBABILISTIC METHODS IN GEOTECHNICAL ENGINEERING

This one day short-course which will be held on Monday 6 August 2018 starts by reviewing basic probability theory and introduces the idea of treating geotechnical engineering properties as random variables. The available tools range from quite simple approximate techniques, such as the FOSM or the FORM to M-C methods involving repetitive calculations. The M-C approaches range from single random variable methods that can be implemented quite routinely, to computationally intensive methods such as the RFEM that properly account for spatial correlation. The tools are described and explored in the context of the risk assessment of common geotechnical design problems, such as slope stability, bearing capacity, and earth pressures. All the software described is available free to the course participants.

## ABOUT THE SPEAKER

### PROFESSOR D. Vaughan GRIFFITHS, PhD, DSc, PE, DGE, CEng, FICE, F ASCE



Vaughan Griffiths completed a Master's degree at UC Berkeley and Doctoral degrees at the University of Manchester, UK. He was a Senior Lecturer at the University of Manchester UK, before moving to his current position as Professor of Civil Engineering at the Colorado School of Mines, USA, where his primary research interests lie in application of finite element and risk assessment methodologies in civil engineering. He has written over 340 research papers, including some of the most highly cited in the geotechnical engineering research literature. He is the co-author of three textbooks that have gone into multiple editions including the Chinese language, entitled "Programming the Finite Element Method", 5th edition, Wiley (2014), "Risk assessment in Geotechnical Engineering" Wiley (2008) and "Numerical Methods for Engineers", 2nd

edition, Chapman & Hall/CRC (2006). He gives regular short-courses for practitioners on risk and finite element applications in geotechnical engineering, with courses recently given in Canada, New Zealand, Colombia, Norway and USA. Dr. Griffiths is a former ASCE Director and is currently an editor of *Computers and Geotechnics*, and on the Advisory Panel of *Géotechnique*. In 2017, he received the H. Bolton Seed Medal from the ASCE/Geo-Institute and was named the Cross Canada Lecturer by the Canadian Geotechnical Society.

## PROGRAM

8.30am – 8.45am	Registration and Introduction
8.45am – 10.15am	<p>Introduction to risk assessment in geotechnical engineering</p> <ul style="list-style-type: none"> <li>• Motivation for the course</li> <li>• Fundamentals of loads and resistances</li> <li>• Basic probability theory</li> <li>• Set theory and Venn diagrams</li> <li>• Conditional probability and total probability theorem</li> <li>• Bayes' theorem</li> </ul>
10.15am-10.30am	Morning Tea provided
10:30am-12.00pm	<p>Introduction to random variables</p> <ul style="list-style-type: none"> <li>• Discrete and continuous random variables</li> <li>• Common probabilistic density functions</li> <li>• Means and variances</li> <li>• Covariance and correlation</li> <li>• Rules for linear functions of random variables</li> </ul>
12.00pm-1.00pm	Lunch provided
1.00pm-2.30pm	<p>Simple tools for probabilistic analysis</p> <ul style="list-style-type: none"> <li>• Rules for non-linear functions of random variables</li> <li>• The First Order Second Moment (FOSM) Method <ul style="list-style-type: none"> <li>○ Example of earth pressure</li> </ul> </li> <li>• Invariance problems with FOSM</li> <li>• The First Order Reliability Method (FORM) <ul style="list-style-type: none"> <li>○ Example of bearing capacity</li> </ul> </li> </ul>
2.30pm-2.45pm	Afternoon tea
2.45pm-4.15pm	<p>Simple tools for probabilistic analysis</p> <ul style="list-style-type: none"> <li>• Monte-Carlo (M-C) methods</li> <li>• Using single random variables <ul style="list-style-type: none"> <li>○ Repeat the same bearing capacity example</li> </ul> </li> <li>• Introduction to random fields</li> <li>• The Random Finite Element Method (RFEM) <ul style="list-style-type: none"> <li>○ Software demos of differential settlement and slope stability analysis</li> </ul> </li> </ul>
4.15pm-4.30pm	<ul style="list-style-type: none"> <li>• Questions and discussion</li> </ul>

**REGISTRATION:** The cost for the one-day workshop program is \$400 for AGS Members, \$450 for non-AGS members and \$250 for University students (including GST). Refreshments will be provided.

Register online: <https://payments.newcastle.edu.au/OneStopWeb/ProbabilisticMethodsInGeoEng>

**WHEN AND WHERE:** Monday, 6 August 2018, University of Technology Sydney Short Courses Venue, Building 10, Level 7, 235 Jones Street, Ultimo.

**ENQUIRIES:** E: [Kirstin.Dunncliff@newcastle.edu.au](mailto:Kirstin.Dunncliff@newcastle.edu.au) or P: +61 2 4921 8832