

SLOPE STABILITY ANALYSIS

A short course by

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for presentation to the New Zealand Geotechnical Society:

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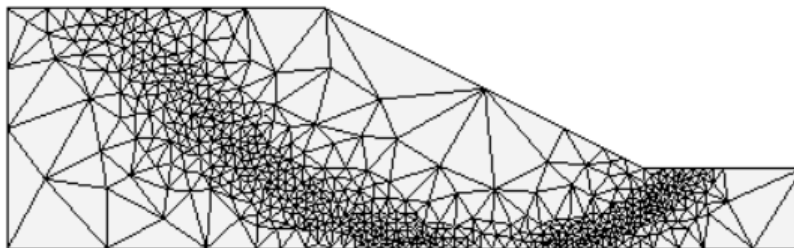
Outline

Slope stability analysis remains one of the most frequently used applications in geotechnical engineering, with numerous methodologies and software packages available for a wide range of soil, groundwater conditions and geometries.

The course will review the evolution of slope stability analysis from its origins over 100 years ago based on circular sliding surfaces, to analytical method based on sliding blocks and methods of slices, through to modern computational methods using finite element methods.

The course will not focus on any one particular methodology or package, but will cover some of the most widely used and emerging slope stability methods and discuss the assumptions involved with numerical examples. The course will present slope stability methods as falling into one of four general categories as follows:

1. **Analytical Methods:** Infinite slopes, analysis of failed slopes or slopes with “obvious” potential failure mechanisms.
2. **Charts:** A review of some of the best known charts suitable for slopes with uniform properties, simple groundwater conditions and geometries (e.g. Taylor, Cousins, Michalowski).
3. **Limit Equilibrium Methods:** Methods of slices are widely used for slopes with soil layering, free-surface groundwater conditions and non-standard geometric profiles. Some of the best known methods of slices will be reviewed (e.g. Ordinary Method of Slices, Bishop, methods for non-circular failure surfaces).
4. **Finite Element (Difference) Methods:** A review, with software demonstrations, of recent developments in powerful numerical methods for slope stability, e.g. elastic-plastic finite element methods with strength reduction¹ and limit analysis methods where the exact solution is “captured” between upper and lower bound solutions.



Example of a refined mesh for slope stability limit analysis (Martin 2011, DOI: 10-1680/geolett.11.00018)

¹ All course participants will be given a free finite element slope stability program