

Objectives

1. To understand the concepts of slope stability analyses and apply them for static loading conditions
2. To use software to analyse the stability of slopes

Prerequisite:

CE804 - Soil Mechanics or equivalent

Unit I: INTRODUCTION

Principles of soil mechanics; stress, strain, and failure in soils; total and effective stresses; drained and undrained shear strength; significance of hydraulic and mechanical properties of soils; behaviour of granular materials: gravel, sand, and rockfill; behaviour of fines; basic requirements for slope stability analyses

Unit II: SLOPE FAILURES AND STABILITY CONDITIONS

Examples of slope failure from various places around the world; causes of slope failure: effects of pore pressure, cracking, swelling, development of slickensides, decomposition of clayey rockfills, creep under sustained loads, leaching, strain softening, weathering, cyclic loading; stability conditions: end-of-construction stability, long-term stability, rapid drawdown, earthquake, partial consolidation and staged construction, other loading conditions

Unit III: LIMIT EQUILIBRIUM PROCEDURES

Definition of the factor of safety; equilibrium conditions; single free-body procedures; procedures of slices: general, circular slip surfaces, non-circular slip surfaces, assumptions, equilibrium equations, and unknowns, representation of inter-slice forces; computations with anisotropic shear strengths; computations with curved strength envelopes; finite element analysis of slopes; alternative definitions of the factor of safety; pore water representation

Unit IV: METHODS OF ANALYSING SLOPE STABILITY

Simple methods of analysis; slope stability charts; spreadsheet software; finite element analyses of slope stability; computer programs for limit equilibrium analyses; verification of results of analyses; examples for verification of stability computations

Unit V: COMPUTER SOFTWARE FOR SLOPE STABILITY ANALYSES

Use of GeoStudio SLOPE/W for slope stability analyses

Laboratory

Performing slope stability analyses using SLOPE/W and computing the factor of safety using various methods for static loads

TEXT BOOKS/REFERENCES

1. *Soil Strength and Slope Stability*, Duncan, Wright, and Brandon, 2nd edition, 2014, John Wiley & Sons, Inc.

2. *Soil Mechanics in Engineering Practice*, Terzaghi, Peck, and Mesri, 3rd edition, 1996, John Wiley & Sons, Inc.
3. *Stability Modeling with SLOPE/W*, GEO-SLOPE International Ltd., 2012 edition 4. *Soil Mechanics*, Lambe and Whitman, 1969, John Wiley & Sons, Inc.
4. *Soil Mechanics*, Lambe and Whitman, 1969, John Wiley & Sons, Inc.