Two-Day Short Course on
Block Theory & Applications for Surficial and Underground Rock Excavations
will be taught by
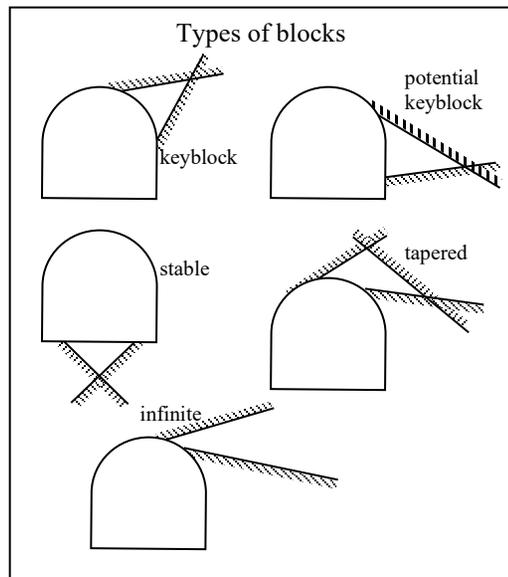**Professor P.H.S.W. Kulatilake**
Professor Emeritus
The University of Arizona
Tucson, Arizona, USA
E-mail: kulatila@u.arizona.edu

Types of blocks

November 29-30, 2022
Course will be taught in
a hotel in Hanoi, Vietnam
Information pertaining to this will be provided in the latter part of October 2022

OBJECTIVES

The objective of the short course is to show the applications of block theory for rock mass surficial and underground excavations. The course lecture notes that is equivalent to about 250 pages will be distributed at the start of the course. Application of the theory will be illustrated using published papers in journals for a few hydro power project sites in China and a few mine sites in USA.

COURSE CONTENT

Part 1: Introduction to Rock Fracture Sets & Rock Block Instability; Stereographic Projection and Discontinuity Shear Strength (1/2 day)
A power point presentation on rock fracture sets and rock block instability; Fracture geometry mapping & basic characterization; Principles of stereographic projection; Shear strength of rock discontinuities; Variability of discontinuity orientation and shear strength.

Part 2: Block Theory & Applications for Surficial Excavations (3/4 day)
Stereographic projections for block theory; Stereographic projection of a joint pyramid; Projection of sliding direction; Types of blocks; Theorem for finiteness; Theorem on the removability of a finite, convex block; Symmetry of block types; Jointed blocks in 2D and 3D; Stereographic solution for jointed blocks; Conditions for removability of blocks intersecting surface excavations; Identification of key blocks in surficial excavations using stereographic projection; Procedures for designing rock slopes; Modes of sliding; Sliding force; Kinematic conditions for lifting and sliding; Stereographic projection for the joint pyramid corresponding to a given sliding direction; Comparison of removability and mode analyses; Application of block theory analyses for surficial excavations using discontinuity data from a few hydro power project sites in China and a few mine sites in USA to find maximum safe slope angles.

Part 3: Block Theory & Applications for Underground Chambers (1/4 day)
Key blocks in the roof, floor and walls; Blocks that are removable at edges; Blocks that are removable at corners; Applications for an underground chamber; Choice of direction for an underground chamber; Intersections of underground chambers; Pillars between underground chambers; Examples.

Part 4: Block Theory & Applications for Tunnels & Shafts (1/2 day)
Geometric properties of tunnels; Blocks with curved surfaces; tunnel axis theorem; types of blocks in tunnels; The maximum key block; Computation of the maximum key block using stereographic projection methods; Removable blocks of the portals of tunnels; Examples.

Who Should Attend:
Civil, Mining and Geo-engineers and geologists who are involved in surface and underground excavations analysis, design and construction activities associated with jointed rock masses will benefit from the short course.

Time Schedule (each day):
8:00—10:00	Lectures
10:00—10:30	Coffee break
10:30—12:30	Lectures
12:30-- 13:30	Lunch
13:30-- 15:30	Lectures
15:30-- 16:00	Coffee break
16:00-- 18:00	Lectures

Narrative Biography of Prof. Kulatilake:
Dr. Pinnaduwa H.S.W. Kulatilake is a Professor Emeritus at the University of Arizona. He is a registered Professional Civil Engineer in California. He received his B.Sc. (in 1976) in Civil Engineering from the University of Sri Lanka, Peradeniya, MS (in 1978) in Soil Engineering from the Asian Institute of Technology, Bangkok, Thailand and Ph.D. (in

1981) in Civil Engineering (with geotechnics emphasis) from the Ohio State University, USA. He has over 40 years of experience in rock mechanics & rock engineering associated with mining, civil geotechnical and geological engineering, and applications of probabilistic and numerical methods to geo-engineering. He has written over 275 papers and is a member of several technical committees. He has an I-10 index of 102 and H-index of 45 in the Google citations. He has delivered over 40 keynote lectures and over 50 other invited lectures throughout the world on topics related to rock fracture network modeling, probabilistic geotechnics, mechanical and hydraulic properties of joints, rock slope stability and mechanical and hydraulic behavior of rock masses. He has been a research paper reviewer for over 30 technical Journals and an editorial board member for several rock mechanics/geotechnics journals. Currently, he is the main Editor-in-Chief of the Geotechnical and Geological Engineering Journal. He is also an Associate Editor in the Geomechanics area for the Arabian Journal of Geosciences. He has taught short courses on stochastic fracture network modeling, rock slope stability analysis, Block theory, and rock joint roughness and aperture in Sweden, Mexico, Austria, USA, Canada, Hong Kong, Poland, Finland, Australia, South Korea, Sri Lanka, Egypt, Iran, Chile, China, Italy, Peru and Tunisia. He has served over 20 years either as the primary or the sole examiner for the geological engineering professional exam conducted by the Arizona State Board of Technical Registration. He was a Visiting Professor at the Royal Institute of Technology and Lulea University of Technology in Sweden as part of his sabbatical leave. Also, he was a Visiting Research Fellow at the Norwegian Geotechnical Institute, for another part of his sabbatical leave. Due to the

contributions, he made on teaching, research, consulting and service activities, he was elected to the Fellow Rank of the American Society of Civil Engineers at the relatively young age of 45. In 2002, he received Distinguished Alumnus Award from the College of Engineering, Ohio State University and Outstanding Asian American Faculty Award from the University of Arizona in recognition of his achievements and contributions made to the advancement of his profession. In December 2005, Eurasian National University, Kazakhstan conferred him "Honorary Professorship". In August 2007, he organized and ran a successful International Conference on Soil & Rock Engineering in Sri Lanka. In January 2009, he organized and ran a high-quality International Conference on Rock Joints and Jointed Rock Masses in Tucson, Arizona. He was the guest editor for two special issues published in the Jour. of Geotechnical and Geological Engineering. He received "Kwang-Hua Visiting Professorship" for 2009-2010 from the College of Engineering, Tongji University, China. He was a Recipient of "Guest Professorship" from Wuhan University, China for 2010-2013. In 2013 and 2016, he received Peter Cundall awards. In 2020-2021, he received Lushan Award from China. Recently (2019-2022) he was a recipient of the 1000 Talent program funding from the Chinese government to work as a Distinguished Professor of Rock Mechanics and Rock Engineering at a Chinese university.

Registration Conditions:
The course fee must be paid in full by the registration deadline of October 26, 2022. The course fee includes course notes, lunch and refreshments for morning and afternoon tea/coffee breaks. The number of applicants for each course is limited and acceptance will be on a first come, first served basis. If the course is

cancelled, then the full short course fee will be refunded. **No refund will be given after October 26, 2022. Non-arrivals at the course will be liable to pay the full course fee and no refund will be given. However, substitutions will be allowed.**

Registration Form
Short Course on Block Theory &
Applications for Rock Excavations
Hanoi, Vietnam, November 2022

Name: _____

Title: _____

Organization: _____

Mailing Address: _____

_____

Telephone Number: _____

Fax Number: _____

E-mail address: _____

Registration Fee: **US$ 495**

I have read and agree to the conditions of entry as stipulated in this brochure.

Signature : _____ Date: _____

Methods of Payment:

Option 1: Make a Cashier's check or money order payable in US funds, through a US bank to:
P.H.S.W. KULATILAKE and mail it to:
 Prof. P.H.S.W. Kulatilake
 Dept. of Materials Science & Engineering
 Mines Bldg. # 12, Rm 131
 1235 E. James E. Rogers Way
 University of Arizona
 Tucson, AZ 85721, USA

Option 2: Wire transfer: Name of the bank, routing number & the account number will be provided later upon receiving the completed Registration form.

excavation surface

(a) infinite
(b) finite, nonremovable, tapered
(c) finite, removable, stable without friction
(d) finite, removable, stable with sufficient friction
(e) finite, removable, unstable without support

EXPLANATIONS
discontinuity normal vectors from set 1
discontinuity normal vectors from set 2
discontinuity normal vectors from set 3
the number of · : 289
the number of · : 144
the number of · : 371

Values given within the [ ] are the maximum cut slope dip angles corresponding to different CSDD values to limit the instability cumulative probability to 5%.