



The UofA
Geotechnical Centre



First Circular
International Short Course on
Permafrost Engineering

**Effective Design and Construction in
Permafrost Regions**

December 5 to December 10, 2013
Edmonton, Alberta

Department of Civil and Environmental Engineering
University of Alberta
and
Cold Regions Geotechnology Division
Canadian Geotechnical Society



Permafrost Engineering

December 5 to December 10, 2013 in Edmonton, Alberta

Why should you attend this Course

Upon completion of the course you will:

- Have a working knowledge of logistic challenges of building in Northern Regions.
- Understand the origin and different types of ground ice
- Know how to determine the existing thermal regime and impact of changing environmental conditions on this regime.
- Understand the unique behavior of freezing, frozen and thawing soils and understand how to design for these conditions.
- Know how to evaluate and design foundations and slopes in permafrost.
- Be exposed to case histories related to hydrocarbon pipelines in permafrost, mine design, tailings impoundments under Arctic conditions and pile foundation support systems in regions of saline permafrost.

Who should attend this Course?

If you are an engineer who has never attended a permafrost engineering course, or want to learn about the latest information in permafrost engineering.

- Public works engineer
- Environmental engineer
- Geotechnical engineer
- Mining engineer
- Construction engineer
- Pipeline engineer
- Regulatory engineer
- Engineers – in-training



COURSE CONTENT

Introduction

Definition of the North.
Environmental Considerations.
Geology and Physiography of Northern Regions.
Definition of Permafrost and its distribution.
Engineering challenges working in a permafrost.

Surface Features (landforms) in permafrost areas

Features associated with freezing, thawing or cyclic freezing and thaw.

Ground Ice and Ground Ice Landforms

Surface and atmospheric water.
Subsurface water.
Ground ice and geology.
Engineering classification of permafrost soils.

Ground Thermal Regime in Permafrost Areas

Earth's energy balance.

Thermal Properties of Frozen and Unfrozen Soils

Thermal conductivity, specific heat, latent heat, and apparent specific heat.

Heat Flow Equations

No phase change, phase change and heat flow around pipes.

Site Investigation in Permafrost Areas

General considerations.
Logistics.
Drilling and sampling.
Geophysical techniques.
Temperature measuring systems.

Frozen Soils Mechanical Properties

Elastic Parameters
Strength properties
Effect of temperature, ice content, confining pressure and time
Special aspects of failure of frozen ground
Creep behavior

Mechanics of Thawing Ground

Amount of thaw settlement and time rates of settlement.
Linear theory of thaw consolidation.

Freezing of Soils and Frost Heave Theory

Frost heave mechanics

Foundations in Permafrost

Geothermal aspects
Shallow foundations
Piles

Slope Stability in Permafrost

Falls, flows and slides
Creep
Cuts in permafrost

Case Histories



Course Conduct and Instructors

You will have numerous opportunities during the course to interact with and learn from the exceptional experienced instructors. Each is a professional engineer with extensive permafrost engineering experience in leading edge research and consulting, as well as, being dedicated to your learning

Kevin Biggar, P.Eng., Ph.D.

Dr. Biggar has worked in Arctic and cold temperature environments since 1981. He has considerable experience in foundations, frost heave, and fate and transport of contaminants in these conditions. He currently co-teaches the Permafrost Engineering graduate course at the University of Alberta. He has done research in the following areas related to Cold Regions engineering: assessment of the fate of petroleum spills in permafrost, remediation of petroleum contaminated sites in Canadian climates, improvement of foundations in permafrost, improvement of electrical grounding in permafrost, ground freezing for soil stabilization and sampling of loose cohesion less sediments, use of freeze-separation to clean up contaminated waters. He also chairs a biennial workshop on assessment and remediation of contaminated sites in Arctic and cold climates

K. Wayne Savigny, Ph.D., P.Eng., P.Geo., P.Geol.

Dr. Savigny is co-founder and a principal of BGC Engineering Inc. He has extensive experience in the overlapping fields of Geological/Geotechnical Engineering, Permafrost Engineering and Engineering Geology, and specializes in the investigation and analysis of geological complexities as they influence engineered development. He has directed large geotechnical engineering and engineering geology investigations for earth dams, tunnels, thermal power plants, pipelines, mines and large industrial complexes, including many in permafrost regions of Canada, Alaska and Russia. He is a specialist in slope stability hazard identification and

mitigation, with experience throughout North and South America and Europe. He has been retained as both an advisor and expert for review panels, litigation cases, inquests, and public hearings.

David C. Seago, Ph.D., P.Eng.

Dr. Seago is a Professor in the Department of Civil and Environmental Engineering at the University of Alberta, Edmonton, Alberta. He currently co-teaches a course on Permafrost Engineering. His industrial experience and research interest focus on behavior of saline and non-saline permafrost and special problems with foundations in saline permafrost. He has directed extensive research studying the interaction of offshore Arctic structures and sea ice. Recently he has undertaken research into dewatering of mine wastes using freeze-thaw, and separating contaminants from industrial wastewater using spray-freezing technology. He also has directed industrial projects and research directed a using artificial ground freezing.

Lukas Arenson, Dr.Sc.Techn.ETH, Dipl.Ing.ETH

Dr. Lukas Arenson's main area of expertise is geotechnical, mountain permafrost engineering with specialization on frozen soil mechanics. He studied the dynamics of ice-rich frozen slopes, in particular rock glaciers, from a geotechnical view point and has expert knowledge in in-situ testing and monitoring of mountain permafrost. In addition, analytical solutions were developed to analyze rock glacier stability. Later, Dr. Arenson concentrated on the thermo-mechanical



processes of frozen and freezing soils on a microstructural level to better understand the strength and deformation properties of frozen soils with changing stress, temperature and salinity. Dr. Arenson has further been studying the effects of natural air convection in cold climates to prevent permafrost degradation, to re-establish pre-construction thermal regimes after pipeline or road constructions, and to accelerate the consolidation of mine waste tailings

General Information

Fee Covers Five full days of instruction, course notes, textbook, list of references for further study, break refreshments, and lunches. Fee does not include lodging or other meals. We do not publish proceedings, and due to copyright laws, course materials are not available for resale after the course.

Cancellation We strongly encourage enrollment in advance as enrollment will be limited and course conduct is also predicted on adequate enrollment. If you cannot attend once enrolled, please notify us immediately. We will refund your fee, or you can have someone take your place. This is a limited enrollment course and "no-shows" will be billed the full amount if they have not cancelled a minimum of 10 working days prior to the start of the course.

Payment Please forward your cheque made payable to The University of Alberta (Permafrost Course) with your registration form. MasterCard and Visa are also accepted for payment of fees. Upon receipt of payment your registration will be confirmed by email or fax.

Enrollment Options Enrollment in advance by fax, phone or mail is recommended before November 15, 2013 (Fee \$2000). After that date, enrollment is available with an additional fee of \$500. If inadequate enrollment is not received by November 15, 2013, the

course will be cancelled and payments refunded. Be sure you receive our confirmation before the course or call 780-492-2176. The course participants will receive a copy of O.B. Andersland and B. Ladanyi's book published in 2003. Students will also receive a two CD set of presentation made at the **Permafrost and Arctic Geotechnology Symposium – Our Canadian Legacy** held November 15 and 16, 2004 in Calgary, Alberta.

Course Location and Accommodation This course will be held at the University of Alberta.

Campus Tower Suite Hotel: Reservations call 1-800-709-1824 or (780) 439-6060. Inform the reservation specialist that you will be attending the University of Alberta Permafrost Engineering Short Course. 1 Bedroom Superior-\$159.00 + tax; bachelor-\$144.00

Lister Hall Conference Centre: Reservations call: (780) 492-6056. New Hotel Style rooms are also available at \$99 + tax per night including continental breakfast, parking, and daily housekeeping.

Varscona: Reservations call: (780) 434-6111. Inform the reservation specialist that you will be attending the University of Alberta Permafrost Engineering Short Course. The standard rooms are available at \$125/night.

The Met Hotel: Reservations call: (780) 465-8150. Inform the reservation specialist that you will be attending the University of Alberta Permafrost Engineering Short Course. The standard rooms are available at \$135/night.



Four Easy Ways to Enroll

	Phone: 780-492-2176
	Fax: 780-492-0249
	Mail to: U of A Geotechnical Center (Permafrost Short Course) University of Alberta Civil & Environmental Eng. Room 1-133 Markin/CNRL Natural Resources Engineering Facility Edmonton, Alberta T6G 2W2
	Internet: http://www.ualberta.ca Email: sally.petaske@ualberta.ca

Enrollment Form

Course Information

Please enroll me in **Permafrost Engineering**
December 5 to December 10, 2013 in Edmonton, Alberta

Fee: (before November 15, 2013): \$2,000.00
(after November 15, 2013): \$2,500.00

Registration Information:

Name: _____

Title/Company: _____

Address: _____

City/Prov./Postal Code: _____

Telephone: _____ Fax: _____

E-Mail: _____

Credit Card Number _____

Name of Cardholder _____

Expiry Date _____

VISA _____ MASTERCARD _____

* Further communication with participants will be via email.