



→ → → ***Subsurface Resource
Characterization
Certificate***

PROGRAM SYLLABUS

Subsurface Resource Characterization Certificate

As a technical specialist, you'll gain the necessary skills for reservoir characterization in a lab or in the production setting.

Gain knowledge and understanding about rock and fluid properties, well logging and formation evaluation, and applied reservoir engineering. You will learn state-of-the-art analytical and numerical methods to develop practical solutions to the current industrial problems in all stages of upstream petroleum engineering operations – from exploration operations and field development to the abandonment of the field at the end of its economic life.

This program also includes seminars on the importance of land use in all land development and resource exploitation. You will develop a foundational appreciation of, and respect for, land use in relation to treaty and/or land agreements with Indigenous nations. Professionals in the petroleum industry need a deep understanding of the Truth and Reconciliation and the Calls to Action to provide unbiased perspectives when working as part of project teams and engaging with ethnically diverse communities.

Participants will gain hands-on experience and learn to use the current state-of-the-art software used for solving practical petroleum engineering problems. Practical training with industry-standard software applications will include Drillbench, Wellflo, Pipesim, CMG, PETREL, IHS, Value Navigator, PVTsim NOVA, among others.

1

**ROCK AND FLUID
PROPERTIES**

2

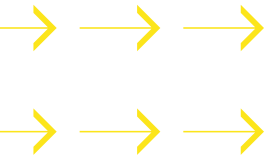
**WELL LOGGING
AND FORMATION
EVALUATION**

3

**APPLIED RESERVOIR
ENGINEERING**

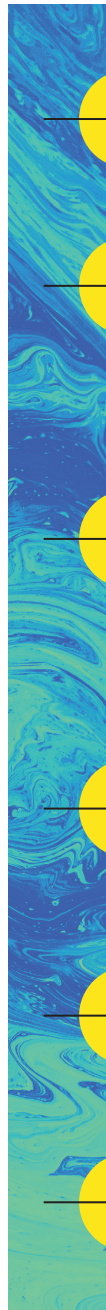


**THE RESPECTFUL
LAND USE SERIES**



Certificate Outcomes

***By completing this certificate,
you will have the ability to:***



Determine physical and engineering properties of reservoir fluids, including density, viscosity, oil and gas formation volume factors.

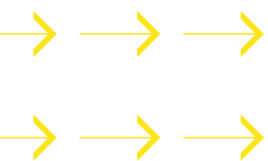
Determine phase behavior of petroleum fluids and their relation to oil and gas recovery.

Determine physical and engineering properties of reservoir rock including, porosity, permeability, wettability, capillary pressure, saturation, relative permeability, strength, deformation, thermal and electrical properties as a function of the subsurface temperature, in-situ stress, pore fluid pressure, and chemical environment.

Conduct formation evaluation and reservoir characterization through the analyses and interpretation of well logs, well tests, and production data.

Estimate and evaluate hydrocarbon reserves and resources (including unconventional resources) using material balance, volumetric, decline curve analysis, and probabilistic techniques.

Appreciate and respect land use in relation to treaty and/or land agreements with Indigenous nations.



Meet Your Instructors



Tayfun Babadagli PHD, PENG

Dr. Babadagli is a professor in the Civil and Environmental Engineering Department, School of Mining and Petroleum Engineering, at the University of Alberta, where he holds an NSERC-Industrial Research Chair in Unconventional Oil Recovery. He previously served on the faculty at Istanbul Technical University, Turkey, and Sultan Qaboos University, Oman. Babadagli holds BS and MS degrees from Istanbul Technical University and MS and PhD degrees from the University of Southern California, all in petroleum engineering.

Dr. Babadagli has provided consultancy services, short courses, and delivered talks to industry, universities, and research centers in more than thirty countries. Babadagli has authored more than 480 technical papers, of which more than 260 appearing in refereed journals, three book chapters, more than 50 technical reports, and he holds one patent.

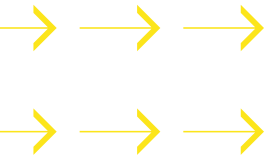
He is currently a member of the JPT Editorial Committee and has served on numerous other SPE educational and research related committees as well as conference/workshop/forum programming and organizing committees. He is also the recipient of the 2017 SPE International Reservoir Description and Dynamics Award. In 2020, Dr. Babadagli was selected as a recipient of SPE and AIME Honorary Membership.



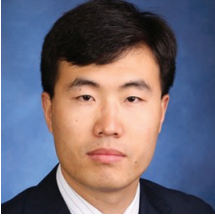
Ergun Kuru PHD, PENG

Dr. Kuru is Professor and Director of Petroleum Engineering at the University of Alberta. He received his B.Sc. degree from Middle East Technical University, M.Sc. and Ph.D. degrees from Louisiana State University all in Petroleum Engineering. For more than 30 years, Dr. Kuru has been teaching courses and conducting research on drilling and well completion engineering related subjects. He has authored/co-authored more than 190 technical papers.

Dr. Kuru's current research area of interest includes: Development of Effective Hole Cleaning Strategies for Oil and Gas Well drilling Applications; Design and Development of Non-Damaging Fluids for Oil/Gas Well Drilling, Completion and Stimulation Applications; Understanding and Mitigating Leakage Pathways in Oil and Gas Well Cements. Dr. Kuru is a member of American Society of Mechanical Engineers (ASME) and the Society of Petroleum Engineers (SPE). Dr. Kuru served several SPE committees in the past including SPE ATCE Drilling Engineering Program Committee, SPE Global Training Committee, SPE Education and Accreditation Committee, Editorial Review Board member of SPE Drilling and Completion Journal and Associate Editor of SPE Journal of Canadian Petroleum Technology. He was also the Associate Editor of ASME Journal of Energy Resources Technology. He is currently serving as a member of SPE Journal of Petroleum Technology editorial board. Dr. Kuru is 2017 recipient of SPE Canada Region Distinguished Achievement Award for Petroleum Engineering Faculty and 2021 SPE Distinguished Member Award.



Meet Your Instructors



Huazhou Li PHD, PENG

Dr. Li is an Associate Professor in Petroleum Engineering at the University of Alberta. He holds a BSc degree and an MSc degree, both in Petroleum Engineering, from the China University of Petroleum (East China), and a PhD degree in Petroleum Systems Engineering from the University of Regina.

His research focuses on improving phase-behavior modeling of complex reservoir fluids and developing novel enhanced oil/gas recovery techniques. He has published one book entitled “Multiphase Equilibria of Complex Reservoir Fluids” and authored more than 100 peer-reviewed journal papers and SPE conference papers. He now serves as an associate editor for Geofluids.

He received the Regional Distinguished Achievement Award for Petroleum Engineering Faculty from the Society of Petroleum Engineers (SPE) in 2020, the Petro-Canada Young Innovator Award from the University of Alberta in 2018, and the Outstanding Technical Editor Award from SPE Journal in 2016, 2019, and 2021. He is a member of SPE and American Chemical Society (ACS).



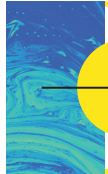
Jessica Vandenberghe MSC, PENG

Jessica is an Industrial Professor - Indigenous Engineering and Assistant Dean (Community and Culture) with Engineering at Alberta where she oversees a wide portfolio that contributes to the development of well rounded and ethically minded engineering students who will ultimately help to build strong and vibrant communities within Canada.

She has worked in the oilsands, mining, regulatory, infrastructure, and consulting industries. She holds a B.Sc. in Chemical Engineering Computer Process Control Co-op and a M.Sc. in Chemical and Mining Engineering, both from the University of Alberta. Her career has taken her to communities large and small around the nation and she has sat on many Boards and Councils with stakeholders, such as federal, provincial and municipal governments, as a representative of First Nations, Metis Settlements and Metis Nations, as well as academic institutions and private industry. As a mother of two and an Indigenous female engineer, she is passionate about diversity, equity, and inclusion, along with Truth and Reconciliation.

1

Rock and Fluid Properties



Huazhou Li PHD, PENG

MAR 2022 | FRIDAYS 4-6 PM | SATURDAYS 9 AM - 4 PM

You will learn the fundamental properties of reservoir rocks and reservoir fluids from both experimental and theoretical perspectives. The experimental techniques used to measure these properties will be explained in detail. Relevant theories/models used to describe/correlate these properties will be covered. The course will also touch on the challenges and opportunities associated with the characterization of rock and fluid properties in tight/shale reservoirs.

Week 1 MARCH 4-5, 2022

Rock properties: Porosity; Permeability; Wettability; Capillary pressure; Fluid saturations; Relative permeability.

Week 2 MARCH 11-12, 2022

Rock properties: Geomechanical properties; Stress sensitivity; Thermal properties; Sonic properties.

Fluid properties: Black oil model; Bubble point pressure; Dew point pressure; Two-phase equilibria; Two-phase envelope; PVT test methods; Microfluidic testing methods – new paradigm.

Week 3 MARCH 18-19, 2022

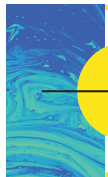
EOS modeling of the phase behavior of reservoir fluids: vdW EOS; SRK EOS; PR EOS; Volume-translated EOS; Plus-fraction characterization; Splitting methods; Lumping methods.

Week 4 MARCH 25-26, 2022

EOS modeling of the phase behavior of reservoir fluids: Bubble point pressure calculations; Dew point pressure calculations; Two-phase equilibrium calculations; Two-phase equilibrium calculations considering capillary pressure; Regression of measured PVT data using EOS models; Minimum miscibility pressure calculations.

2

Well Logging and Formation Evaluation



Ergun Kuru PHD, PENG

APRIL 2022 | FRIDAYS 4-6 PM | SATURDAYS 9 AM - 4 PM

Develop your understanding of basic principles of open-hole well logging and formation evaluation tools. You will learn conventional, reconnaissance, and graphical, open hole log interpretation techniques as well as techniques of evaluating shaly formations and gas bearing formations, and techniques of evaluating unconventional shale oil/shale gas reservoirs.

Week 1 APRIL 1-2, 2022

Measurement environment. Filtrate invasion. Formation temperature. Mud, mud filtrate, and mud cake resistivity. Formation water salinity. Basic open-hole well logs. Spontaneous potential (SP) log. Gamma ray (GR) log. Resistivity Logs. Determination of R_t and R_{xo} from resistivity Logs.

Week 2 APRIL 8-9, 2022

Porosity Logs. Density Log. Neutron Log. Sonic Log. Combination Log Systems. Conventional log interpretation techniques. Cut-off saturation and cut-off porosity. Movable oil saturation (MOS). Determination of R_w . Sensitivity of calculated water saturation to saturation exponent "n" and to cementation exponent "m". Acquiring data from logs. Correlation between logs. Detection of permeable beds. Zones selection.

Week 3 APRIL 15-16, 2022

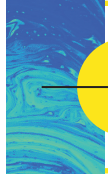
Reconnaissance interpretation techniques. Apparent water resistivity, R_{wa} method. F and R_o logs. R_{xo}/R_t method. Graphical interpretation techniques (crossplots). Hingle resistivity-porosity crossplots. Pickett resistivity-porosity crossplots. Lithology-porosity crossplots. Lithology-porosity crossplots using two porosity tools. Lithology-porosity crossplots using three porosity tools.

Week 4 APRIL 22-23, 2022

Evaluation of shaly formations. Shale content evaluation. Porosity logs in shaly formations. Water saturation determination in shaly formations. Evaluation of gas bearing formations. Gas effect on porosity logs. Gas effect on lithology-porosity crossplots. Visual gas detection. Shaly gas-bearing formations. Nuclear magnetic resonance (NMR) logging. Evaluation of unconventional shale reservoirs.

3

Applied Reservoir Engineering



Tayfun Babadagli PHD, PENG

NOV/DEC 2022 | FRIDAYS 4-6 PM | SATURDAYS 9 AM - 4 PM

Learn the practical aspects of reservoir engineering. The course covers reservoir engineering principles, different methods to assess the field performances and methods to develop different types of fields.

Week 1 NOVEMBER 4-5, 2022

Fluid Flow in Porous Media: Petroleum geology, classification of sedimentary rocks. Petroleum entrapment. Basic properties of petroleum fluids. Rock properties, petrophysics: Permeability, porosity, relative permeability, capillary pressure and wettability concepts. Darcy and non-Darcy flow.

Week 2 NOVEMBER 11-12, 2022

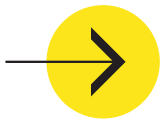
Fundamentals of Reservoir Engineering and Management: Performance of whole reservoir. Tank model (material balance). Material balance equations. Natural reservoir drive mechanisms. Estimation of reserves and reservoir performance. Volumetric methods for reserves estimation. Decline curve analysis for reserves estimation. Material balance: for reserves and performance estimation of Gas reservoirs, Gas-condensate reservoirs, Undersaturated oil reservoirs, Natural water drive (water influx) reservoirs. Monte Carlo technique for reserves and performance estimation. Solution gas drive and waterflooding performance prediction (diffuse and segregated flow. Viscous, gravity, and capillarity dominated displacement).

Week 3 NOVEMBER 18-19, 2022

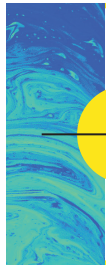
Performance of single well: Diffusivity equation and pressure transient in oil and gas reservoirs. Pressure transient analysis (well testing). Inflow performance analysis. Horizontal wells.

Week 4 NOVEMBER 25-26, 2022

Effective Reservoir Management: Appraisal of oil and gas fields (pressure, PVT data, STOIP, GIIP, recoverable reserves, recoverability, well testing). Assessment of reservoir quality. Field development plans. Reservoir management concept. Reservoir characterization and performance analysis using production data. Project: A field development project using reservoir engineering techniques.



The Respectful Land Use Series



Jessica Vandenberghe MSc, PEng

DATES: TBA

NOTE: This seminar series does not need to be repeated if you take more Petroleum Certificates in the future.

Participants will participate in three seminars on the importance of land use in all land development and resource exploitation, developing a foundational appreciation of, and respect for, land use in relation to treaty and/or land agreements with Indigenous nations.

Seminar 1 INTRODUCTION TO TRUTH AND RECONCILIATION

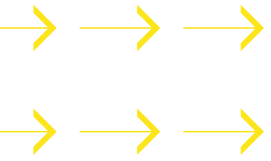
This one-hour seminar will be provided by a trained facilitator of Indigenous descent and will explore the history of Canada through the Indigenous lens of experiences and incidents that occurred, touching on the results and impacts of the Indian Act, Human Rights, and data that demonstrates that Indigenous people continue to be subject to oppressive policy, inherent racism, prejudice and stereotypes.

Seminar 2 UNDERSTANDING INDIGENOUS WORLDVIEW TOWARDS LAND SPIRIT AND MAKING THE CONNECTION TO INDIGENOUS COMMUNITIES AND LAND OWNERSHIP

This is a one-hour seminar, supplemented with reading, reflection and an assignment. It will guide participants towards understanding the differences between Settler and Indigenous perspectives towards land. It will also touch upon the governance laid out by the Indian Act around reserve lands, land ownership, and build an understanding of why reserves and Metis Settlements are different from municipalities and counties.

Seminar 3 HOW PROFESSIONAL ENGINEERS HAVE A RESPONSIBILITY TO ANSWER THE CALLS TO ACTION IN THEIR PROJECT WORK AND ETHICAL BEHAVIOUR

This one-hour seminar will be offered by a trained Indigenous Professional Engineer facilitator and discuss the Professional Engineer's ethical obligations and why equity, diversity, inclusion and decolonization are foundational to risk management, project management, decision making, and design work. Essential to meeting these ethical obligations is the deep understanding of Truth and Reconciliation and the Calls to Action in order to provide unbiased perspectives when part of project teams and engaging with ethnically diverse communities.



Certificate Details

Prerequisites:

A post-secondary degree or diploma in engineering, science or related field

Investment:

\$6000 + GST
Paid in three installments

Engineering at Alberta

We are one of the top five engineering schools in Canada, with more than 4,400 undergraduate students and 1,200 graduate students. Our Petroleum Engineering program ranks as one of the Top 10 Petroleum Engineering programs in the world.

Now we are offering new programs for the working professional. This is a place that uncovers the unknown. Where ideas take the stage and possibility runs the show. We train people to embrace curiosity, providing state-of-the-art facilities, award-winning faculty and support.

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[QUESTIONS? DR. ERGUN KURU - EKURU@UALBERTA.CA](mailto:DR. ERGUN KURU - EKURU@UALBERTA.CA)

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