

Short Course

Geology for Engineers

Instructors: Thomas F. Moslow, Moslow Geoscience Consulting,
Jean-Yves Chatellier, Tecto Sedi Integrated Inc.

Location: Classroom, Downtown Calgary (location to be shared with registrants)
AER Core Research Centre, 3545 Research Way, NW, Calgary, AB (1Day)

November 17-20, 2026 / 8:30am-4:30pm (MST)

Course Description

This 4-day course presents the basics of petroleum geology with an emphasis on unconventional oil and natural gas reservoirs of clastic and carbonate origin. Lectures are supplemented with case examples from classic unconventional plays in western Canada (i.e. Montney, Duvernay, McMurray). Topics include the fundamental principles of sedimentary geology as applied to hydrocarbon exploration and reservoir development, the stratigraphy of Western Canada, the origin and heterogeneity of conglomerate, sandstone, siltstone and carbonate reservoirs and a review of the unique properties of shale as source rocks and hydrocarbon reservoirs. Other topics include clastic and carbonate environments of deposition, reservoir quality and architecture and the lateral variability and heterogeneity of clastic and carbonate reservoirs as applied to the predictability of outcomes in horizontal drilling. The class will also examine carbonate and clastic cores from conventional and unconventional (i.e. tight) reservoirs. Printed course notes and a full day session at the Alberta Energy Regulator (AER) Core Research Centre in Calgary are included.

General Course Format

Days 1-3: Lectures, Classroom, Calgary City Centre

Day 4: Core Workshop at the AER Core Research Centre, University Research Park, 3545 Research Way NW, Calgary

Technical Content and Objectives

This course is designed for reservoir or completions engineers, geophysicists, log analysts, technologists and non-technical professional managers who need to understand the fundamentals of petroleum geology and/or reservoir geology. A knowledge of geology as a prerequisite to this course is not necessary.

Attendees will learn the basics of petroleum geology as applied to hydrocarbon exploration and reservoir development in both clastic and carbonate formations. Emphasis is placed on unconventional reservoirs including heavy oil plays and tight, or permeability challenged, reservoirs of oil and natural gas that have become the emphasis of horizontal drilling and resource play development in most of North America's onshore basins. In addition to the standard lecture format for presentation of information, a practical hands-on experience is provided through the examination of drill core during a lab day at the AER Core Research Centre, commonly the exclusive work environment of the subsurface geologist.

The information from this course will provide participants with knowledge of the fundamental geologic parameters of hydrocarbon plays that determine reservoir quality, variability, heterogeneity,

predictability and economic viability. Learning outcomes would include the ability to communicate more effectively with the exploration geologist working within an asset or property development team. Other learning objectives include gaining an understanding of the criteria used to rank hydrocarbon prospects and resource plays in terms of technical risk based on geological attributes.

Course Itinerary

Day 1: Lectures, Classroom, City Centre Calgary

8:15 - 8:30AM: Introduction to Course: format, outline, objectives, instructor's background, expertise and professional experience. (TM)

1. 8:30 - 8:45AM: The view of the world and thought processes of the subsurface geologist:
 - Approaches to problem solving, extrapolation and interpretation, qualitative risk assessment;
 - Inherent variability and predictability;
 - Tools: outcrop, core, logs, analytical rock analyses.
2. 8:45 – 9:15AM: Fundamental Principles of Sedimentary Geology (as applied to hydrocarbon exploration and reservoir development):
 - Basic geological concepts (i.e. Uniformitarianism, Steno's Principles and stratal succession, Walther's Law and facies, Geologic Cycle, Geologic Time (relative and absolute);
 - Terminology and "buzz words" in sedimentary geology. (TM)

Break

3. 9:30 – 10:15AM: Plate Tectonics:
 - Differentiation of the Earth (lithosphere/crust, mantle, core), continental drift and seafloor spreading, major features of the Earth's surface (i.e. mountain belts, oceans, sedimentary basins)
 - Eustatic and relative sea-level
 - Geological history of the Earth's crust; subduction (JC)

Break

4. 10:30 – 12:00PM: Sediment and sedimentary rocks (the host of hydrocarbons): Origin, composition, texture, fabric and classification of sedimentary deposits; source terrain/provenance, and transport, organic accumulation or precipitation of sedimentary deposits and impact on mineralogy, primary porosity and permeability:
 - Clastics (conglomerate, sandstone, siltstone, shale) (TM)
 - Carbonates (boundstone, grainstone, packstone, wackestone, mudstone) (JYC)

Lunch

5. 1:15 – 2:00PM: The Hydrocarbon Trap in Conventional and Unconventional Reservoirs (source, reservoir, seal, trap and the concept of the "resource play"); examples from the WCSB. (TM)

Break

6. 2:15 – 3:00PM: Shales as Source Rock and Reservoir (unique properties, origin of porosity: examples from the WCSB. (JYC)

Break

7. 3:15 – 4:15PM Integration of Geoscience and Engineering Data in conventional and unconventional reservoir assessments and completions.
 - Reservoir formation mineralogy and inorganic geochemistry (XRD – XRF)
 - Mercury Injection / Capillary Pressure Primary (MICP) histograms for assessing effective vs. total porosity;
 - Determining total organic carbon from logs for shale reservoirs
 - Case examples (JYC)
8. 4:15 – 4:30PM: Questions and Discussion (End of Day)

Day 2: Lectures, Classroom, City Centre Calgary

1. 8:15AM – 9:15AM: Sedimentary processes and physical and biogenic sedimentary structures and the origin of lateral-vertical variability /predictability and facies heterogeneity; impact on sedimentary fabric on reservoir quality (i.e. primary porosity and permeability):
 - Clastic sediments/sedimentary rocks and process sedimentology (TM)

Break

1. 9:30 – 10:30AM: Carbonate sediments (ecology, mineralogy, nature of deposition, origin) (JYC)

Break

2. 10:45AM – 11:20AM: Sedimentary Facies and Environments of Deposition (environmental reconstructions; origin and examples of reservoir architecture)
 - Clastics (TM)
3. 11:25AM – 12:00PM: Sedimentary Facies and Environments of Deposition (environmental reconstructions; origin and examples of reservoir architecture)
 - Carbonates (JYC)

Lunch

4. 1:15 – 2:15PM: Depositional Systems (spectrum, variation, modern and ancient examples)
 - Clastic depositional systems and reservoir examples (TM)

Break

5. 2:30 – 3:15PM: Depositional Systems (spectrum, variation, modern and ancient examples)
 - Carbonate depositional systems and reservoir examples (JYC)

Break

6. 3:30 – 4:15PM: Geological structures, tectonics and impact on hydrocarbon reservoirs:
 - Origin of structures
 - Folds, faults and fractures
 - Concepts of stress and strain; geomechanics

- Poisson Ratio, Young's Modulus and relationship to rock lithology, compaction and cementation;
 - Map expression and cross-sectional view of various structures (impact on reservoir heterogeneity and trap origin) (JYC)
7. 4:15 – 4:30PM: Questions and Discussion (End of Day)

Day 3: Lectures, Classroom, City Centre Calgary

1. 8:15 – 9:15AM: Burial and Diagenesis: pathway to ultimate reservoir properties (the good, the bad and the ugly):
- Clastics: compaction, cementation, detrital and antigenic clays, secondary porosity, slot porosity, fracturing, formation sensitivity and reservoir damage; range and variability in permeability for convention/unconventional reservoirs; examples. (TM)

Break

2. 9:30 – 10:30AM: Burial and Digenesis: pathway to ultimate reservoir properties
- Carbonates: dolomitization and fabric replacement. dissolution/precipitation; cements; secondary porosity; fracturing. (JYC)

Break

3. 10:45 – 12:00PM: Clastic Stratigraphy:
- Concepts of lithostratigraphy and sequence stratigraphy in clastics and carbonates;
 - The reservoir as a parasequence and facies associations;
 - Reservoir architecture and heterogeneity at the parasequence level. (TM)

Lunch

4. 1:15 – 2:15PM: Carbonate Stratigraphy:
- Concepts of lithostratigraphy and sequence stratigraphy in carbonates;
 - The reservoir as a parasequence and facies associations;
 - Reservoir architecture and heterogeneity at the parasequence level, (JYC)

Break

5. 2:30 – 3:00PM Origin and Fill of the Western Canada Sedimentary Basin (WCSB):
- Stratigraphy of the WCSB (Table of Formations)
 - Paleozoic (the continental margin basin)
 - Triassic–Jurassic (docking of autochthonous terrains)
 - Cretaceous-Tertiary (the foreland basin). (TM)

Break

6. 3:15 – 4:00PM: Temporal / Spatial relationships in basin-fill architecture of the WCSB: (45 mins)
- Orogenic events
 - Major structural lineaments;
 - Subcrop edges and major unconformities (JYC)
7. 4:00 – 4:15PM: Review of Core Workshop (TM)
8. 4:15 – 4:30PM: Questions and Discussion (End of Day)

Day 4: 8:30AM – 12 Noon and 1:15 – 4:15PM: Core Workshop (Lunch will be catered)

AER-Core Research Centre Core Workshop: 3545 Research Way NW, Calgary, Alberta

Review of clastic and carbonate reservoirs of conventional and unconventional origin form a variety of formations and producing intervals within the Western Canada Sedimentary Basin. Cores will be reviewed in the context of well log signatures, trends in porosity and permeability and formation production history.

Biographies



Dr. Tom Moslow is President of Moslow Geoscience Consulting Ltd. and an Adjunct Professor in the Department of Geoscience at the University of Calgary. He was a former Professor (1987–1994) at the University of Alberta Department of Earth and Atmospheric Sciences and Louisiana State University Department of Geology and Geophysics (1983-87). Tom was employed by Canadian Hunter Exploration Ltd. (1995-1970) and Ulster Petroleum (1997-2000). In 2000, he became a co-founder of Midnight Oil & Gas Ltd., which led to the creation of Daylight Energy Trust. He held executive positions in subsequent affiliated companies. He is the author or co-author of over 100 publications and has won numerous awards and honours for his work and research including the 2021 Stanley Slipper gold medal from the CSPG. His current consulting work is focused on the Triassic and Lower Cretaceous of Western Canada and resource play geology in general including both domestic and international ventures.

Jean-Yves Chatellier is a geoscience consultant based in Calgary. Previously he worked as a Senior Geoscientist with Shell, Talisman Energy and CNOOC. He was for seven years Reservoir and Structural Geology Senior Research Advisor for the research laboratory of PDVSA.

His principal expertise is in data analysis and multidisciplinary integration in tectonically complex areas using geochemistry, geology, geophysics and engineering. His present focus is on methods to improve frac placement in shale and tight sands and on conventional exploration in carbonates.

He received his BSc in geology from Lille University, an MSc and a PhD in tectonics from Paris VI University. While in the French Army he received an MSc in sedimentology from the University of Calgary.