PETROLEUM – TECHNICIAN (PETN 2021)

Preamble

The Canadian Technology Standards (CTS) are a collection of learning outcomes for Canada's engineering technology and applied science profession at the technician and technologist level.

Stakeholders

The CTS may be utilized by accreditation bodies, provincial professional associations, educational institutions, government agencies, industry and others for the purposes accreditation, certification and other applications.

Educational Programs

The Petroleum CTS is relevant to programs including, but not limited to, petroleum at the at the technician level.

Learning Outcomes

This CTAC list Discipline Learning Outcomes (DLO) which describe the significant and essential learning that students have achieved and can reliably demonstrate at the time of graduation. Each DLO has a number of Learning Outcome Indicators (LOI), which are examples illustrating, defining and clarifying the level of performance expected. The list of LOI is not comprehensive and there may be other indicators which can be used to assess achievement of learning outcomes.

DLO and their LOI employ only cognitive domain verbs selected from a table of cognitive verbs modeled after a Bloom's cognitive domain table of verbs adapted specifically for engineering technology and applied science disciplines.

Graduate Capability

Students graduating from an accredited program have demonstrated achievement of all general learning outcomes, including a prescribed level of math, and discipline learning outcomes selected by the program.

Having completed a program that is based on applied mathematics and scientific and engineering theory, principles and practices and having acquired the knowledge, skills and attitudes to function in the work place, graduates are;

- able to evaluate assignments, establish objectives, set parameters and determine appropriate procedures and actions.
- able to exercise due diligence in the workplace and adhere to related practices, applicable laws and health and safety practices.
- able to work in accordance with labor-management principles and practices.
- able to work independently or interdependently as part of a discipline or multi-disciplinary team.
- prepared to assume responsibility for their work.

Graduate Career Opportunities

Graduates of Petroleum Technology - Technician programs have career opportunities in such areas as: business, industry, construction, government, and public organizations. They may find employment in careers such as: design / maintenance of equipment, preparation of specifications, drawings, or instructions; and areas of upstream research and development, exploration, production, drilling, refining, supply operations, transportation, field and customer service; estimating; technical sales; supervision of projects; training activities; and many other areas.

Discipline Learning Outcomes (DLOs)

PETN01   Drilling, Completion, and Well Intervention
➢ Implement procedures for drilling, completion, and well intervention.

Learning Outcome Indicators include:
1.1   Collaborate in planning of well operations.
1.2   Collaborate in design of equipment for well abandonments.
1.3   Collaborate in design and planning of vertical, horizontal, and directional drilling programs.
1.4   Differentiate between types of drilling fluid systems and drilling fluid equipment.
1.5   Describe commonly used drilling applications, techniques, and equipment.
1.6   Monitor well bore conditions and determine perforating techniques and equipment.
1.7   Describe procedure for commonly used stimulation techniques.
1.8   Describe major components of normal drilling operations involved in rotary drilling.

PETN02   Petroleum Formations
➢ Collaborate in identifying and applying appropriate methods of evaluating petroleum formations.

Learning Outcome Indicators include:
2.1   Maintain coring equipment.
2.2   Collaborate in interpreting core samples.
2.3   Collaborate in analyzing data from specialty logs and recognize their limitations.
2.4   Collaborate in analyzing data from cased hole logging tools to determine formation characteristics and well performance.
2.5   Collaborate in evaluating operation of open hole logging tools.
2.6   Determine interaction between drilling fluid and a potential reservoir rock.
2.7   Document data from suites of open hole logs.
2.8   Perform preliminary calculations to determine hydrocarbon saturation.
2.9   Perform basic analysis of rock cuttings and samples.

PETN03   Petroleum Reservoirs and Reserves
➢ Collaborate in evaluating petroleum reservoirs and reserves.

Learning Outcome Indicators include:
3.1   Perform calculations associated with reservoir depletion techniques.
3.2   Determine properties of reservoir fluids under various conditions.
3.3   Describe phase behaviour of hydrocarbon in the reservoir or in surface processing equipment.
3.4   Determine volume of oil, gas, and condensate in a reservoir using appropriate methodology.

3.5   Calculate natural gas from coal reserves.
3.6   Predict behaviour of reservoir given various drive mechanisms.
3.7   Collaborate in evaluating and comparing oilfield projects based on decline rate predictions, royalty calculations, and resource pricing.
3.8   Access well retrieval and analysis information applying appropriate software.
3.9   Perform decline curve analysis using well production data and appropriate software.
3.10   Describe economic evaluation of petroleum industry projects.
3.11   Explain physical laws and relationships affecting multi-phase fluid flow through petroleum reservoirs.

PETN04   Oil and Gas Well Production
➢ Collaborate in the analysis of oil and gas well production techniques and methodology.

Learning Outcome Indicators include:
4.1   Collaborate in interpreting well production data and making recommendations to improve oil and gas well production.
4.2   Collaborate in interpreting and applying Darcy's Equation of Flow through porous media to oil and gas well productivity.
4.3   Collaborate in evaluating performance of rod pump and pumpjack on conventional oil well.
4.4   Collaborate in designing electric submersible pumps and downhole oil water separators for producing high water cut oil wells.
4.5   Collaborate in designing progressive cavity pumps for producing cold heavy oil wells.
4.6   Apply nodal analysis to flowing wells and gas-lifted wells.
4.7   Identify well performance problems and solutions applying appropriate wellbore modelling software.
4.8   Collaborate in analyzing production facility capacity and predict future requirements.
4.9   Determine personnel requirements and plan for system reliability applying methods of operations planning and control.

PETN05   Petroleum Facilities
➢ Collaborate in the design and planning of petroleum facilities.

Learning Outcome Indicators include:
5.1   Collaborate in analyzing production facility capacity and predict future requirements.

5.2   Describe appropriate equipment for treatment of crude oil and natural gas.
5.3   Write safe operating procedures.
5.4   Troubleshoot problem scenarios relative to flow rates, tank gauging, and flow

meters.
5.5   Start up, operate, and shutdown pilot plant and process simulations as part of a process team.
5.6   Implement written procedures for pigging a flowline, swinging a well into the test separator, and gauging a production tank.
5.7   Determine heater performance and troubleshoot problems.
5.8   Measure and describe physical pumping parameters of triplex pump.
5.9   Collaborate in measuring and calculating gas flows using an orifice gas flow meter and orifice plates given the differential operating conditions.
5.10 Collaborate in performing calculations on the operation of propane refrigeration systems from relevant operating information.
5.11 Determine properties of natural gas and model gas processing systems applying appropriate software.
5.12 Determine inspection and commissioning requirements for pipelines and production/process equipment.
5.13 Collaborate in the management of corrosion control and monitoring programs.

PETN06   Environmental & Economic Issues
➢ Collaborate in the evaluation of petroleum engineering projects in a manner consistent with environmental, legal, ethical, safety, and economic criteria.

Learning Outcome Indicators include:
6.1   Collaborate in planning, scheduling, and monitoring projects in the upstream petroleum industry applying technical, economic, and quality principals.
6.2   Implement basic quality control systems.
6.3   Identify regulations and licensing requirements in upstream petroleum facilities.
6.4   Identify industry standards in upstream petroleum facilities.
6.5   Apply basic economic principles.
6.6   Identify and contribute to mitigating accidents in the workplace.
6.7   Identify and contribute to mitigating workplace hazards commonly found in the workplace.
6.8   Collaborate in the application of environmental procedures pertaining to the drilling of oil and gas wells and the construction and decommissioning of oil and gas production facilities.
6.9   Collaborate to ensure compliance with relevant environmental legislation pertaining to the operation, construction, and decommissioning of upstream oil and gas production facilities and jurisdictions of the regulatory agencies involved in each phase.
6.10 Contribute to the application of basic economic principles to petroleum industry projects.

PETN07   Geological Data
➢ Collaborate in analyzing and interpreting geological and geophysical data.

Learning Outcome Indicators include:
7.1   Describe appropriate exploratory methodology for oil and gas.
7.2   Collaborate in the analysis and solution of structural geology problems applying fundamental aspects of stress, strain, and mechanical behaviour of rock materials.
7.3   Collaborate in interpreting maps, fence diagrams, and sections using drill hole, surface geology, and geophysical data.
7.4   Construct geological maps from subsurface data analyses.
7.5   Collaborate in identifying and interpreting structural and stratigraphic traps as possible locations for further exploration.
7.6   Determine processes of sedimentation and origins of deposits utilizing sedimentary structures and textures.
7.7   Collaborate in resource exploration and development from interpretation of topographic maps.
7.9   Collaborate in resource exploration and development from interpretation of air photos.
7.10   Collaborate in identifying and interpreting possible migration routes for hydrocarbons.
7.11   Collaborate in interpreting seismic data.
7.12   Test and identify pore fluids in host rocks.
7.13   Test host rock porosity and permeability.
7.14   Prepare reports using geological data.

PETN08   Land Acquisition Procedures
➢ Collaborate in interpreting surveys, maps, land division, and acquisition procedures.

Learning Outcome Indicators include:
8.1   Access and explain survey data.
8.2   Collect and translate data into a GIS system.
8.3   Explain land acquisition process.

PETN09   Gathering Systems
➢ Collaborate in planning, design, and sizing of gathering systems for oil and gas.

Learning Outcome Indicators include:
9.1   Describe procedures used for field handling of gas.
9.2   Construct flow diagrams.
9.3   Collaborate in planning pipeline transportation systems.

PETN10   Project Management
➢ Explain and employ principles of project management.

Learning Outcome Indicators include:
10.1   Employ basic concepts of project management.
10.2   Collaborate in project management projects applying project-specific information and utilizing appropriate software.
10.3   Prepare schedules and reports using project-related records and inventories.