MINERAL RESOURCES – TECHNICIAN (MRTN 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 Mineral Resources CTS is relevant to programs including, but not limited to, environmental protection, geology, mining, and mineral resources at the at the technician level.

Learning Outcomes

This CTS 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 Geological and Mineral Resource 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: maintenance of equipment, processes, infrastructure, or systems; preparation of specifications, drawings, or instructions; quality operations; operations and maintenance; field and customer service; estimating; technical sales; supervision of projects; training activities; and many other areas.

Discipline Learning Outcomes (DLOs)

GMRTN01   Geophysical Surveys
➢ Conduct geophysical surveys and analyze geophysical profiles and maps.

Learning Outcome Indicators include:
1.1   Collaborate to analyze, and interpret hydrocarbon, coal, or other economic potential of geologic zones using a combination of open-hole log readings.
1.2   Calculate water saturation and/or other properties of subsurface sediments, rocks, and structures using electrical properties.
1.3   Apply appropriate methodology and practical procedures for surface electromagnetic methods.
1.4   Apply appropriate methodology and practical procedures for magnetic methods.
1.5   Collaborate to evaluate electromagnetic data from geophysical borehole logs.
1.6   Collaborate to analyze and interpret seismic geophysical data.

GMRTN02   Maps and Cross Sections for Mineral Exploration
➢ Collaborate to create and interpret geological maps and cross sections for mineral exploration.

Learning Outcome Indicators include:
2.1   Relate geologic units using stratigraphic principles.
2.2   Produce and interpret geological maps and cross sections.
2.3   Produce, measure, and interpret stratigraphy from outcrop data.
2.4   Produce and manipulate a stereo net to solve structural problems.
2.5   Classify deposits.
2.6   Process and illustrate geological data applying appropriate computer software.

GMRTN03   Field Procedures
➢ Perform appropriate field procedures for the acquisition of geological and geochemical data.

Learning Outcome Indicators include:
3.1   Measure and layout distances and create grids with chains.
3.2   Determine differences in elevations using a surveyor's level.
3.3   Perform topographic surveys that can be used for construction, such as for grading and contour plans.
3.4   Design field mapping and geochemical sampling programs from existing geological maps and cross sections.
3.5   Develop accurate geological maps from field observations applying field-mapping methodologies.
3.6   Describe the process of diamond drilling, logging diamond drill core, mining agreements, equity finance, and field safety and logistics.

GMRTN04   Maps for Oil and Gas Exploration
➢ Collaborate in the interpretation of geological maps and cross sections for oil and gas exploration.

Learning Outcome Indicators include:
4.1   Produce and explain geological maps and cross sections.
4.2   Measure and explain stratigraphy of sedimentary outcrops.
4.3   Describe the occurrence and development of hydrocarbon resources.
4.4   Process and illustrate geological data applying appropriate computer software.

GMRTN05   Mineral Deposits
➢ Collect and evaluate mineral deposits.

Learning Outcome Indicators include:
5.1   Identify various metallic and precious mineral deposits.
5.2   Identify, illustrate, and list mineralization associated with basic rocks.
5.3   Identify and classify common ore minerals and their oxides and sulfates.
5.4   Identify and distinguish various types of uranium, copper, and industrial mineral occurrences.
5.5   Examine and describe mineral processing and extraction operations.
5.6   Calculate simple weighted grade and perform reserve calculation procedures as applied to core intervals, or bore holes in an alluvial deposit.
5.7   Describe blasting processes, common products, simple circuits, equipment, terms, and procedures.

GMRTN06   Soil and Groundwater
➢ Collaborate to assess behavior of contaminants in soil and groundwater.

Learning Outcome Indicators include:
6.1   Identify and differentiate major types of groundwater contaminants, the sources of groundwater contamination, and the various criteria and standards that are applied to contaminants in ground water.
6.2   Describe the types of inorganic contaminants that might affect groundwater quality and their fate in the environment.
6.3   Manage the preservation and storage of ground water samples with appropriate documentation using proper sampling protocols.
6.4   Apply soil and water quality guidelines.
6.5   Collect groundwater samples for laboratory analysis and collect and document water well field data for review and discussion of results.
6.6   Implement a site assessment and contaminant monitoring program applying appropriate equipment and sampling protocols.
6.7   Collaborate to interpret the history of groundwater flow in a basin, and classify the flow systems using groundwater geochemistry.
6.8   Prepare a field verification record sheet for a given location.

6.9   Perform field-screening techniques commonly used in groundwater and soil sampling evaluation.

GMRTN07   Geologic Formations
➤ Collaborate in identifying geologic formations, structures, and processes.

Learning Outcome Indicators include:
7.1   Describe the history of geological formations using principles of geological time.
7.2   Identify and contrast landscapes and deposits resulting from weathering, erosion, mass wasting, and glacial processes.
7.3   Classify the formation of igneous, sedimentary, and metamorphic rocks.
7.4   Identify and distinguish common geologic structures.
7.5   Identify and classify geologic and terrain features using topographic and geologic maps.
7.6   Identify and classify common sedimentary, igneous, and metamorphic rocks.
7.7   Identify various ore deposit processes, and associated alterations in a discussion of ore deposits using appropriate terminology.

GMRTN08   Hydro-Geological Data
➤ Collect and differentiate hydro-geological data.

Learning Outcome Indicators include:
8.1   Apply hydraulic parameters to porous media and quantitatively describe fluid flow in the subsurface by calculating standard aquifer characteristics.
8.2   Determine the grain size and permeability of sediments and formations by conducting tests.
8.3   Determine typical sedimentary zones by examining open hole logs.
8.3.1   Use drill stem test results to determine zone permeability and productivity.
8.4   Design and maintain water wells that meet a variety of defined needs.
8.5   Calculate groundwater flow parameters, boundary conditions, and safe-yields from pump test and slug test data.
8.6   Document the drilling and installation of monitoring wells by recording and collecting field data.
8.7   Interpret terrain and groundwater features using air photos and maps.
8.8   Describe the history of groundwater flow in a basin and classify the flow system using groundwater geochemistry and isotope chemistry.