Mining Engineering Technician

Program Outline 2025-2026

PROGRAM INFORMATION

Academic Year: 2025-2026
Credential: Ontario College Diploma
Program Delivery: Full-Time
Duration: 2 years
Length: 4 Semesters
Program Code(s) M002 - Haileybury Campus (HL)
M042 - Distance (CH)

DESCRIPTION

Mining engineering technicians are the educated and practical connection between mining engineers, geoscientists and the other mine departments. They use technology to collect and analyze data, report findings and help operating departments be successful throughout the mine life. Engineering technicians work in mines and mineral processing plants across northern Ontario and around the world.

They monitor the plant operation and adjust chemistry and machinery to optimize recovery of minerals such as base metals, industrial minerals, gold or diamonds; and they prepare reports that guide management of a mine site. They help with the environmentally responsible operation of mine waste storage areas and play key roles in their reclamation.

Engineering technicians work in teams with engineers and geologists to plan and design surface and underground mine excavations to access and extract valuable minerals. They select equipment and plan efficient use of explosives and materials. They use drawings and communication tools to help mine operators understand and follow the plans, and they use technology to monitor the mining work to make sure the plans are followed. They measure the results and calculate performance to produce reports that help the mine operate as a profitable business.

Engineering Technicians perform field work in geology and exploration that help define where mining will happen next. Northern College Haileybury School of Mines is known for the quality of its geology programming. Students learn skills to test and identify rocks and minerals, and learn how to manage and present geological data for use in industry.

Being a Mining Engineering Technician from Northern College Haileybury School of Mines is your ticket to tackling the world of mining.

CAREER OPPORTUNITIES

Graduates may find employment as: surveyors, planners, production supervisors, assayers, process operators, metallurgical technicians, exploration or mine geological technicians, government mine inspectors, mine technicians (ventilation, ground control, environmental, projects), and/or sales and technical representatives.

- Mining engineering technician
- Employed by petroleum and mining companies, consulting geology and engineering firms, and by government and educational institutions, and a variety of manufacturing, construction and utilities companies.

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VOCATIONAL LEARNING OUTCOMES

1. Conduct air volume measurements and rock stability assessments to develop and implement plans that ensure worker safety and regulatory compliance.
2. Use computer software for mine modeling, drafting, and database management to generate mine plans, sections, and reports that support efficient mine operation and decision-making.
3. Select and install infrastructure and communication technologies to enhance utility management and data flow for improved operational efficiency.
4. Perform underground and surface surveys to gather data for the design and planning of mining operations.
5. Collect and analyze geological samples to evaluate ore reserves and support mining assessments.
6. Conduct safety inspections, report findings, and implement risk mitigation strategies to ensure compliance with mine safety standards.
7. Develop and implement strategies for continuous learning and professional development to maintain technical expertise and improve performance in mining operations.
8. Evaluate rocks and mineral samples, as well as unit processes involved in mineral beneficiation to improve extraction efficiency and meet operational targets.
9. Develop and implement mine schedules and blast designs using industry-standard software to enhance safety and operational efficiency.

PROGRAM COURSES

The following reflects the planned course sequence for full-time offerings of the program. Programs at Northern College are delivered using a variety of instruction modes. Courses may be offered in the classroom or lab, entirely online, or in a hybrid mode which combines classroom sessions with virtual learning activities.

Semester 1		**Hours**
CH1033	Chemistry	42
CM1323	Professional Communications	42
GN1033	Health and Safety	42
GN1443	Indigenous Culture and Awareness	42
IN1173	Computer Applications for Business	42
MA1100	Mathematics I	56
MI1003	Mineralogy and Geology I	42
MI1024	Intro to Mining	42
Semester 2		
CM2303	Communications in the Workplace	42
IN1224	Computer Aided Drafting (CAD) I	56
MA2104	Mathematics II	56
MI1004	Mineral Processing I	42
MI1103	Surveying Principles I	42
MI2004	Mineralogy and Geology II	42
MI2042	Physics for Mining	28
MI2043	Mining II (Surface Mining)	42
MI3043	Surveying II - Mining Field School I	45
MI3163	Mineralogy & Geology III - Mining Field School I	45

Semester 3

EL1021	General Education Elective	42
IN4052	AutoCAD II	28
MA3033	Mathematics III	42
MI3033	Mining III (Underground Mining)	42
MI3093	Surveying III	42
MI3103	Safety and Loss Control	24
MI4004	Mineralogy and Geology IV	42
MI6053	Ground Control	42

Semester 4

EL1022	General Education Elective	42
MA6023	Statistics	42
MI2053	Effective Supervision	42
MI4012	Environmental Principles for Mining	28
MI4013	Surveying IV - Mining Field School II	30
MI4043	Mineral Processing II - Mining Field School II	30
MI4083	Mineralogy and Geology V	42
MI4093	Mineralogy and Geology VI - Mining Field School II	30
MI4123	Underground Mine Design - Applied	42
MI4203	Mine Ventilation Studies	42

PROGRAM PROGRESSION

The following reflects the planned progression for full-time offerings of the program.

Sem 1: Fall 2025
Sem 2: Winter 2026
Sem 3: Fall 2026
Sem 4: Winter 2027

ADMISSION REQUIREMENTS

- Ontario Secondary School Diploma (OSSD)
- Grade 12 English (C, U)
- Grade 12 Math (C, U) (MCT4C preferred; MAP4C is accepted with a minimum GPA of 60%)
- Grade 12 Chemistry (C, U) is recommended)
- Grade 12 Physics (C, U) is recommended
- Or equivalent

Academic prerequisites for this program may be obtained free of charge through Academic Upgrading.

Applicants who do not have a high school diploma or equivalent and will have reached the age of 19 years on or before the start of the program must undergo academic testing and may be required to complete Prior Learning Assessment & Recognition (PLAR) process to demonstrate equivalency of admission requirements prior to admission into a program.

For more details, please contact the Admissions Office at 705-235-7222 or admissions@northern.on.ca.

Additional Requirements for International Students

In addition to the admission requirements, international students must have proof of English Proficiency and meet the requirements below.

1. Proof of Senior High School Diploma/Certificate
2. English Proficiency (we will require one of the following):
    - IELTS Academic International English Language Testing System: a minimum overall score of 6.0 must be achieved with no individual band score under 6.0; however, we will accept one band at 5.5.
    - TOEFL (Test of English as a Foreign Language) – Internet Based Test (iBT) overall minimum score of 79
    - PTE (Pearson Test of English) Academic – Graduate Diploma: 58+
    - Duolingo: 105+

If your country of citizenship has English as its official language, we may accept alternate proof of English Proficiency. All educational documents must be submitted in English and will be dependent on the country of citizenship. For more information, please contact admissions@northern.on.ca.

PROGRAM SPECIFIC REQUIREMENTS & ADDITIONAL INFORMATION

The Mining Engineering Technician program requires two Field School components to be completed on-site in Haileybury. The Field Schools are typically two weeks in length and take place in May.

- Mining Field School Supplies [PDF, 290 KB]

Work Integrated Learning Opportunities

N/A

Articulation / Transfer Agreements

A number of articulation agreements have been negotiated with universities and other institutions across Canada, North America and internationally. These agreements are assessed, revised and updated on a regular basis. Please contact the program coordinator for specific details if you are interested in pursuing such an option. Additional information can be found at Articulation Agreements.

GRADUATION REQUIREMENTS

32 Program Courses
2 Communications Courses
3 General Education Courses

Graduation Eligibility

To graduate from this program, a student must attain a minimum of 60% or a letter grade of CR (Credit) in each course in each semester unless otherwise stated on the course outline. Students should consult departmental policies and manuals for additional details and exceptions.

Graduation Window

Students unable to adhere to the program duration of two years (as stated above) may take a maximum of four years to complete their credential. After this time, students must be re-admitted into the program and follow the curriculum in place at the time of re-admission.

CONTACT INFORMATION

For questions about being admitted into the program, please contact Northern College Admissions at admissions@northern.on.ca or by phone at 705-235-3211 ext. 7222. For questions about the content of the program, contact the Program Coordinator.

Kellie Broderick, Program Assistant
Tel: 705-672-3376 ext. 8854
Email: broderickk@northern.on.ca

COURSE DESCRIPTIONS

Semester 1

CH1033 Chemistry
This is a course in general chemistry designed to provide a fundamental background for students to understand chemical concepts and to appreciate the applications and implications of chemistry in technology and society.

CM1323 Professional Communications
In this course, students will learn essential skills for success in college and the workplace. This course focuses on developing and strengthening oral and written communication skills, and critical thinking ability. During this course, students will engage in a variety of forms of communication with a focus on upholding the principles of academic integrity. Students will develop the skills necessary to create discipline-specific documents, practice business etiquette and professionalism, and apply critical thinking strategies to practical scenarios. Upon successful completion of this course, students will be able to plan and draft concise, coherent and well-organized writing assignments that are tailored to specific audiences and purposes.

GN1033 Health and Safety
This course introduces the student to health and safety in their home, in society and within an occupational setting. Students learn about the social and personal benefits of safe work practices and the methods to best prevent accidents or injuries. Students will review the role, rights and responsibilities of an individual in today's health and safety conscious world. Students also learn how to read and interpret the Occupational Act and Regulations.

GN1443 Indigenous Culture and Awareness
This general education course will provide students with an introduction to Canadian Indigenous Nations' history, sovereignty, land titles, cultural history and current critical issues. Topics addressed include the content of Indigenous rights, economic and social development, community and political processes, and business law and policies, justice & social services. Canadian Indigenous History and Relations is a general education course that has been incorporated into all programs at Northern College.

IN1173 Computer Applications for Business
In this course, students will gain practical experience with Microsoft Excel for Windows. Excel will be used to prepare various reports, presentations and applications which directly correlate to the critical-thinking requirements of the workplace. Students will gain practical experience working with formulas and functions, developing, and enhancing financial reports, organizing data with charts, data lists, and tables, managing multiple work sheets, workbooks, and external data sources, developing macros, using conditional functions, working with financial tools and functions, and performing what-if analysis.

MA1100 Mathematics I
This course covers basic algebra properties, graphing the straight line, basic geometry and trigonometry, and solving a system of equations graphically and algebraically. It also covers vector addition by components and by the cosine and sine laws.

MI1003 Mineralogy and Geology I
The geology of the Precambrian, Palaeozoic and Cenozoic eras is introduced in this course. Students are introduced to mapping techniques and the “art” of visualization. Topics include basic geological structures, historical geology and physical processes such as glaciation. Mineralogy is introduced through the physical properties of minerals.

MI1024 Intro to Mining
This course discusses the origin and history of mining and its contributions to ancient and modern civilizations. Students are introduced to basic geological and mining terminology, mineral reserve estimation, the mining sequence and to some of the legal requirements governing mining activities.

Semester 2

CM2303 Communications in the Workplace
In this course, students will develop professional communication skills required for success in the workplace. Students will continue to develop and strengthen their oral and written communication skills and critical thinking abilities. During this course, students will use various modes of communication to complete assignments designed to meet program and professional expectations. Students will utilize a variety of technologies for the purpose of creating a professional presence in a digital environment. Students will develop the necessary skills to create polished workplace documents such as letters, resumes, cover letters and reports tailored to specific audiences. Students will learn to conduct themselves with professionalism in both workplace interviews and job searches. Upon successful completion of this course, students will be able to create clear, concise and coherent workplace and employment documents that are error-free and designed for specific audiences and purposes.

IN1224 Computer Aided Drafting (CAD) I
This is an introductory course designed to teach students the basics of using the AutoCAD drafting software to create 2 dimensional drawings. Lessons include using the draw, modify, layering and annotation commands.

MA2104 Mathematics II
MA2104 is the second course in the math stream for students in an Engineering Technician / Technology program. The emphasis of this course is on solving equations relating to quadratics, logarithms, exponentials, with sections on factoring, fractional equations, manipulating exponent and radical expressions, and complex numbers, and for some programs studying systems of linear equations and determinants. Applications of the basic concepts, to particular fields of study, will be covered. The second semester Mathematics course is designed to give the student the mathematical tools required to function in his/her special field of study. Students are encouraged to seek help after class hours if problems are encountered in the course. Every effort will be made to identify problem areas for the student, but in the final analysis, it is the responsibility of the student to ask for help. Prerequisite: MA1100 – Mathematics I (with 60%)

MI1004 Mineral Processing I
This course will introduce the student to mineral processing theory, equipment and process. It will look at the steps involved in basic mineral processing of ores, from extraction to the disposal of tailings.

MI1103 Surveying Principles I
This course is an introduction to the basic principles of Plane Surveying. The theory and use of theodolites/total stations, steel tapes and levels will be covered. Basic surveying calculations for direction, coordinates and area will be included.

MI2004 Mineralogy and Geology II
This course is the continuation of the study of minerals including native elements, sulphides, arsenides, and some oxides. Also, physical geology is studied with topics including maps, an introduction to air photos, mineral exploration, processes affecting and forming the earth, and some qualitative geochemical analysis.

MI2042 Physics for Mining
This half-semester course reviews concepts of metric and British systems of units, conversions, vectors, statics, motion, force, work, and energy. The objective of this course is to familiarize students with the basic principles of physics that have application in many of the technologies associated with mining, geology and metallurgy.

MI2043 Mining II (Surface Mining)
This course introduces basic engineering principles used for the design and development of surface mines. The various types of methods and material handling systems used in the exploitation of surface mines are also discussed.

MI3043 Surveying II - Mining Field School I
In this 1-week survey field course, a "hands-on" project-oriented approach is emphasized. Projects will include operating an automatic level to run a level loop and operating a total station to measure the distances and interior angles of a survey traverse. Emphasis will be placed on maintaining proper field notes.

MI3163 Mineralogy and Geology II - Mining Field School I
Students will learn to recognize geological features such as faults, striations, roche moutonnées, pillow lavas, sills, dykes, varves, ripple marks, rock textures, etc. Local geological history will be synthesized and explained by studying field relationships of nearby rocks. Students will also become familiar with certain field mapping/ illustration techniques and develop a panorama of cross-sections across the Cobalt camp. Studying hand specimens will strengthen students' identification of minerals and mineral groups.

Semester 3

EL1021 General Education Elective
General Education Courses are selected online each semester by the student from a list provided and exposes students to a related area of study outside of their immediate academic discipline. Certain programs have predetermined electives.

IN4052 AutoCAD II
This course first reviews the basic drawing, editing and display commands used in Release 2021. Advanced drawing, editing and display commands relating to blocks, Xrefs, attributes, and hatching are learned. Commands for drawing and modelling in 3-D are introduced. Practical assignments relate to office plans, wireframing, geology plans and cross-sections, 3-D visualization and a milling flow sheet.

MA3033 Mathematics III
MA3033 focuses on additional topics in algebra, geometry and trigonometry. Applications from many fields of technology are explored to show where and how mathematical techniques are used in the real world. Emphasis is placed on doing mathematics. The learner is expected to apply time and effort to understanding the basic concepts. The learner is also expected to apply time and effort in demonstrating acquired knowledge by solving basic word problems involving technical applications. Using mathematics effectively in everyday situations requires the ability to apply a wide variety of mathematical skills accurately. Students who successfully complete this course will have demonstrated their ability to apply the concepts of number and space to situations which include quantities, magnitudes, measurements, and ratios. They will have developed their ability to identify the need for mathematics, to apply mathematical techniques (concepts, conventions, strategies, and operations) and to check the results of their analyses. This will require flexibility, creativity and confidence which can only be gained through practice. Elements of the Performance include:

- Recognize real-life problems that require mathematics to solve Assess potential mathematical strategies (including models, geometric representations or formulae, elementary algebraic equations, descriptive statistical methods, and mathematical reasoning) for suitability and effectiveness
- Decide on the degree of accuracy required for answers
- Estimate probable answers
- Execute mathematical operations necessary to implement selected strategies
- Use calculators or appropriate technological tools to perform mathematical operations accurately
- Check for errors in numerical answers and the appropriate fit between problems and answers
- Express answers clearly
- Transfer the use of mathematical strategies from one situation to another

MI3033 Mining III (Underground Mining)
This course starts with a review of basic mining nomenclature, calculations, processes, planning and guiding tools and other activities performed at the exploration & evaluation stages of the mining sequence. Next, rules-of-thumb and basic engineering principles used for the design, development and exploitation of underground mines are introduced. Various types of underground mine development openings, mining methods, rock breakage and material handling systems used in underground mining are also discussed.

MI3093 Surveying III
The survey course is project oriented with the objectives of making the student familiar with differential leveling methods, the operation and care of optical theodolites, as well as the application of basic underground surveying procedures and calculations.

MI3103 Safety and Loss Control
This half-semester course examines the concepts of Safety and Loss Control in organizations. Students will review the elements of a well-designed Occupational Health and Safety program, the principle of due diligence, the basic causes of accidents and/or injuries as well as practices used to identify, control and evaluate hazards in the workplace.

MI4004 Mineralogy and Geology IV
This course is designed to continue field mapping techniques, specifically on a detailed grid, as well as traverse mapping. Concurrently, students will cover a course in Exploration Geochemistry (concepts, practical computer exercises and limited field work), as well as be introduced to GPS systems. Advanced topics in Plate Tectonics will also be introduced. These skills will be practiced in Mineralogy and Geology IV.

MI6053 Ground Control
This course covers intact rock properties, rock mass characteristics and classification. Other topics include: geo-technical data collection, rock stress distribution and failure, induced stresses around openings, underground opening and pillar design, rock reinforcement and support, ground support systems, such as mesh, bolt, cable and shot Crete, and ground system design.

Semester 4

EL1022 General Education Elective
General Education Courses are selected online each semester by the student from a list provided and exposes students to a related area of study outside of their immediate academic discipline. Certain programs have predetermined electives.

MA6023 Statistics
This course will cover such topics as: classification of data using Excel, x-y graphs, bar graphs and pie charts; organization of data into frequency distributions, calculation of the mean, the median, variance and standard deviation for grouped data; probability and frequency distributions, binomial and normal distributions, estimation of population means, standard deviation and proportions within a given confidence interval; control charts for statistical process control; and regression and correlation analysis. Pre-requisites: MA1100 Mathematics I

MI2053 Effective Supervision I
This course briefly reviews the history of the managerial concept and discusses organizations and modern managerial functions. Students are introduced to the roles and duties of supervisors in modern organizations and some of the legal requirements and liabilities associated with supervisory activities.

MI4012 Environmental Principles for Mining
This half-semester course briefly reviews potential environmental impacts of mining. Students are also introduced to environmental regulatory requirements, best practices, monitoring and reporting.

MI4013 Surveying IV - Mining Field School II
In this 3-day survey field course, practical hands-on underground skills and calculations are emphasized. Topics include total station basics, data collector technology, underground surveying techniques, shaft plumbing techniques, control survey verification and GPS applications. Emphasis will be placed on maintaining proper field notes of all information gathered.

MI4043 Mineral Processing II - Mining Field School II
Students review and analyze in detail the equipment, process steps and environmental considerations involved with the milling and extraction of various ores, and in particular those of an operating mine and mill site we visit during the course.

MI4083 Mineralogy and Geology V
This course extends the study of fundamental Mineralogy into the systematic study of the principal rock-forming mineral families (especially silicates and secondary silicates), including properties and uses, as well as introducing petrology. Students will learn to identify major rock types. Also, students will be introduced to geochemical exploration and hydrology.

MI4093 Mineralogy and Geology VI - Mining Field School II
Students demonstrate knowledge of additional field mapping techniques, specifically on a detailed grid, as well as traverse mapping. They demonstrate knowledge of Garmin and Trimble GPS packages/systems. Students deepen their fundamental mineralogy knowledge via laboratory study, identifying hand specimens of oxides, chlorides, fluorides, carbonates and the principal mineral families (especially silicates) and rocks.

MI4123 Underground Mine Design - Applied
This course guides students through the integration of mining engineering technician program subject material in the design of excavations for underground development and production mining. Through application of their knowledge gained in surveying, ground control, geology, ventilation, physics and underground mining; students will consider example site conditions to develop efficient and safe designs for excavations to access and extract ore including infrastructure for mine operations and maintenance. Students will use advanced CADD tools and techniques to produce 3d designs with a focus on outputs of high-quality drawings and layouts typical to mining industry needs and in compliance with Ontario Acts and Regulations for Mines. Use of multiple software packages for mine design, modelling and simulation will provide experience with benefits and limitations of different data and file formats, and teach practical skills in converting between them while maintaining data integrity and accuracy. Students will become proficient in effect use of Point Cloud, Vector and Imagery data as collected from surveying, scans, and other sources. Assignments include integrated use in highly communicative documents, drawings and models, as well as effective and secure layer and drawing file management in engineering department settings with multiple clients requiring concurrent access to singular data sets.

MI4203 Mine Ventilation Studies
This course reviews fundamental design principles of underground mine ventilation such as air flow and resistance estimation, fan selection and mine air quality. Students are also introduced to mine ventilation monitoring, control techniques and legislated requirements.