



9148

G E O L O G I C A L   E N G I N E E R I N G  
( 1 1 A )

30S/30E/30M



# 9148 GEOLOGICAL ENGINEERING (11A)

## 30S/30E/30M

### Course Description

This course is an introduction to geology, covering the Big Bang to the formation of minerals. Curriculum content focuses on introducing students to the study of the planets, earthquakes, geologic maps, and plate tectonics. This course covers the three rock groups, their chemical makeup, and how they are formed and change over time. Basic identification of minerals and rocks is a large part of this course, with a focus on hands-on practice. Topics include the following:

- theories of the origin and formation of the universe, solar system, and planet earth
- the structure of planet earth
- continental drift and plate tectonics
- the field of mineralogy and the role of mineralogists in mining
- definition of minerals and how they are formed
- identification of minerals based on physical and chemical makeup
- definition and formation of rocks (igneous, metamorphic, sedimentary)
- identification of rocks based on physical and chemical makeup

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**Goal 1:** Describe and apply appropriate **health and safety** practices.

**GLO 1.1:** Describe and apply appropriate **health and safety** practices.

- SLO 11A.1.1.1 Demonstrate an understanding of hazards in the mining industry.
- SLO 11A.1.1.2 Discuss and demonstrate safe work practices.
- SLO 11A.1.1.3 Demonstrate an understanding of air quality hazards.
- SLO 11A.1.1.4 Discuss and demonstrate safe work practices related to air quality.
- SLO 11A.1.1.5 Create and maintain a safe and organized work environment.
- SLO 11A.1.1.6 Discuss procedures for reporting hazards.

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**GLO 1.2:** Demonstrate an awareness of safety as it pertains to the **Trade Safety Awareness Manual**.

No applicable SLOs.

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**Goal 2:** Demonstrate the identification, selection, use, and maintenance of **tools, equipment, materials, and consumables.**

**GLO 2.1:** Demonstrate the identification, selection, use, and maintenance of **tools, equipment, materials, and consumables.**

SLO 11A.2.1.1 Demonstrate the identification, selection, use, and maintenance of tools, equipment, materials, and consumables.

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**Goal 3:** Demonstrate an understanding of the theories related to the **origins of the universe, solar system, and planet earth.**

**GLO 3.1:** Demonstrate an understanding of the theories related to the origins of planet earth, particularly with respect to geology.

SLO 11A.3.1.1 Demonstrate an awareness of geology and the geosciences.

SLO 11A.3.1.2 Outline the main tenets of the Big Bang theory of the origin of the universe, and describe the available evidence that supports the theory (e.g., cosmic microwave background radiation).

SLO 11A.3.1.3 Demonstrate an understanding of the formation and life cycle of the sun, and relate this to the origin of the solar system.

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**Goal 4:** Demonstrate the ability to provide basic descriptions of the **layered structure of planet earth, the dynamic processes that affect it, and the evidence** that supports our current understanding.

**GLO 4.1:** Demonstrate the ability to provide basic descriptions of the **layered structure of the earth, the dynamic processes that affect it, and the evidence** that supports our current understanding.

SLO 11A.4.1.1 Illustrate by use of a diagram an understanding of the structure of planet earth.

SLO 11A.4.1.2 Describe Alfred Wegener's main ideas in the early 20th century regarding continental drift, and then show evidence that supported the theory.

SLO 11A.4.1.3 Outline the major objections to continental drift theory by its opponents.

SLO 11A.4.1.4 Describe how the recent theory of plate tectonics explains continental drift.

SLO 11A.4.1.5 Describe with examples how plate tectonics explains phenomena such as earthquakes, volcanic activity, and the origin of mineral deposits.

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**Goal 5:** Identify the environment that allows for the formation of **minerals** that are important to the mining sector, as well as the basic characteristics of those minerals.

**GLO 5.1:** Demonstrate a basic understanding of the formation of **minerals**, and the ability to identify common minerals and their characteristics.

SLO 11A.5.1.1 Demonstrate an awareness of the formation of minerals.

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**Goal 6:** Demonstrate an understanding of the formation of **rocks** and how their formation is related to their characteristics and identification.

**GLO 6.1:** Demonstrate an understanding of the environment that allows for the formation of common **rocks**, and relate their characteristics to their identification.

SLO 11A.6.1.1 Describe in a general way the formation of igneous rocks (both extrusive and intrusive), and demonstrate the ability to identify them in a field setting.

SLO 11A.6.1.2 Describe the formation of sedimentary rocks, and demonstrate the ability to identify them in a field setting.

SLO 11A.6.1.3 Identify common sedimentary rocks using physical and chemical properties.

SLO 11A.6.1.4 Describe the formation of metamorphic rocks, and demonstrate the ability to identify them in a field setting.

SLO 11A.6.1.5 Identify metamorphic rocks using physical and chemical properties.

SLO 11A.6.1.6 Identify common igneous rocks using physical and chemical properties, and demonstrate the ability to identify them in a field setting.

SLO 11A.6.1.7 Identify igneous rocks using physical and chemical properties.

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**Goal 7:** Use various **surveying** techniques to describe and map potential ore bodies in a field setting.

**GLO 7.1:** Use various **surveying** techniques in land surveying.

No applicable SLOs.

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**GLO 7.2:** Use various surveying techniques in **hydrographic surveying**.

No applicable SLOs.

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**GLO 7.3:** Use various surveying techniques in **mine surveying**.

No applicable SLOs.

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**Goal 8:** Demonstrate an understanding of **exploration, development, and production** of mineral resources from a position of environmental stewardship and sustainability.

**GLO 8.1:** Demonstrate an understanding of common **exploration** techniques, with attention to the principles of **sustainable practices**.

No applicable SLOs.

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**GLO 8.2:** Demonstrate an understanding of mine **development** with an emphasis on **environmental responsibility**.

No applicable SLOs.

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**GLO 8.3:** Demonstrate an understanding of **mine production** and its place within the overall **life cycle** of a mine operation.

No applicable SLOs.

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**Goal 9:** Demonstrate an understanding of the processes used in **accessing, recovering, transporting, and processing ore**.

**GLO 9.1:** Demonstrate an understanding of the processes used in **accessing, recovering, transporting, and processing ore**.

SLO 11A.9.1.1 Demonstrate an understanding of the processes used in accessing, recovering, transporting, and processing ore.

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**Goal 10:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills relevant to mining engineering technology.

**GLO 10.1:** **Read, interpret, and communicate** information relevant to mining engineering technology.

SLO 11A.10.1.1 Read, interpret, and communicate information.

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**GLO 10.2:** Apply the knowledge and skills from **mathematics** relevant to mining engineering technology.

SLO 11A.10.2.1 Demonstrate an understanding of using and calculating angles.

SLO 11A.10.2.2 Demonstrate proficiency in the use of fractions, decimals, ratios, percentages, and the conversion of metric (SI), standard or imperial measures.

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**GLO 10.3:** Apply the knowledge and skills from **the sciences** relevant to mining engineering technology.

SLO 11A.10.3.1 Demonstrate an understanding of geologic time scales.

SLO 11A.10.3.2 Demonstrate an understanding of basic chemistry as it pertains to the composition and structure of rocks and minerals.

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**GLO 10.4:** Apply the knowledge and skills from **information and communication technology (ICT)** relevant to mining engineering technology.

No applicable SLOs.

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**Goal 11:** Demonstrate an awareness of **sustainability principles** as they influence mining engineering technology.

**GLO 11.1:** Describe the mining industry's **sustainability practices** and impact on the environment.

No applicable SLOs.

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**GLO 11.2:** Describe the impact of **human well-being as a sustainability priority** among those employed in the mining sector and the individuals and communities affected by mining practices.

SLO 11A.11.2.1 Discuss long-term health hazards related to field geology.

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**GLO 11.3:** Describe **sustainable business practices** within the mining industry.

SLO 11A.11.3.1 Discuss, using examples or a case study, business practices that promote the long-term viability of mines and mining complexes.

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**Goal 12:** Demonstrate an awareness of the **ethical and legal standards** as they pertain to the mining industry.

**GLO 12.1:** Demonstrate an awareness of the **ethical and legal standards** that pertain to the mining industry.

SLO 11A.12.1.1 Discuss ethical considerations in the mining industry.

SLO 11A.12.1.2 Discuss the consequences of unethical behaviour.

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**Goal 13:** Demonstrate fundamental **employability skills**.

**GLO 13.1:** Demonstrate **fundamental employability skills**.

SLO 11A.13.1.1 Demonstrate regular and punctual attendance.

SLO 11A.13.1.2 Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, co-workers, and students.

SLO 11A.13.1.3 Demonstrate accountability by taking responsibility for their actions.

SLO 11A.13.1.4 Demonstrate adaptability, initiative, and effort.

SLO 11A.13.1.5 Demonstrate teamwork skills.

SLO 11A.13.1.6 Demonstrate the ability to stay on task and effectively use time in class and work environments.

SLO 11A.13.1.7 Demonstrate the responsible use of wireless communication devices.

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**GLO 13.2:** Demonstrate an awareness of **cultural proficiency** and its importance in the workplace.

No applicable SLOs.

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**GLO 13.3:** Demonstrate an understanding of the **business operation** of a mine complex.

No applicable SLOs.

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**GLO 13.4:** Demonstrate **critical thinking skills**.

SLO 11A.13.4.1 Analyze and synthesize information in order to identify rocks and minerals.

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**Goal 14:** Demonstrate an understanding of the **mining industry**.

**GLO 14.1:** Demonstrate an understanding of the scope of the mining industry as it functions in Canada today in an international context.

SLO 11A.14.1.1 Describe the mining industry in Canada, with an emphasis on Manitoba.

SLO 11A.14.1.2 Discuss the place of mining in the Canadian economy.

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**GLO 14.2:** Demonstrate an understanding of the **educational and career opportunities**, as well as **industry, professional, and trade associations**, related to mining engineering technology.

SLO 11A.14.2.1 Describe the professions related to geology.

SLO 11A.14.2.2 Discuss the level of physical fitness required by field geologists.

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**GLO 14.3:** Demonstrate an understanding of **working conditions** in mining.

SLO 11A.14.3.1 Describe working conditions related to geology.

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**Goal 15:** Demonstrate an awareness of the **evolution, technological progression, and emerging trends** in mining.

**GLO 15.1:** Describe the **history, technological progression, and emerging trends** in mining.

SLO 11A.15.1.1 Describe the history, technological progression, and emerging trends in geological engineering technology.

