A. COURSE DESCRIPTION

Credits: 4
Lecture Hours/Week: 0
Lab Hours/Week: 0
OJT Hours/Week: *.*
Prerequisites: None
Corequisites: None

MnTC Goals: Goal 03 - Natural Science

The course provides understanding of how crystals and crystalline structures are formed, as well as minerals and igneous and metamorphic rocks. It includes learning to use tools and diagnostic tests for identification of minerals in hand samples and in the polarizing microscope and other instruments. The course also includes the study of the genesis, classification, and identification of igneous, and metamorphic rocks. Finally, the potential of a region to produce mineral resources is discussed. Lecture and laboratory. [Core Curriculum Goal Area 3 (LC)]

B. COURSE EFFECTIVE DATES: 05/04/2024 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Introduction
2. Formation of rocks and minerals
3. Fundamentals of crystal structures
   - Intro to crystallography
   - The 32 Crystal classes
   - Crystal morphology, crystal symmetry and crystallographic axis
4. Crystal Chemistry:
   - Mineral groups and physical properties
   - Phase diagrams
5. Optical mineralogy
   - Properties of light, minerals and polarized light,
   - Pleochroism, refractive indices.
   - Isotropic minerals
   - Uniaxial Minerals
   - Biaxial Minerals
6. Gemstones
   - Minerals and gemstones
   - Classification of gemstones
   - Physical properties of gemstones and tools used to identify gemstones
7. Origin of igneous rocks and mode of occurrence
   - Minerals forming igneous rocks
8. Classification of igneous rocks
9. Origin of metamorphic rocks and mode of occurrence
   - Metamorphic rock forming minerals
10. Types of metamorphism
    - Geothermometers and geobarometers
11. Economic resources derived from minerals and igneous and metamorphic rocks
D. LEARNING OUTCOMES (General)

1. analyze properties to classify and identify common minerals in hand specimen and using the petrographic microscope and other instruments.
2. explain how a mineral is categorized as a gemstone. Describe gemstone classification systems.
3. explain the principles behind igneous and metamorphic rocks forming processes.
4. identify, describe, and classify common igneous and metamorphic rocks in hand specimen and using the petrographic microscope.
5. formulate hypotheses about how common minerals, igneous and metamorphic rocks are formed.
6. analyze the economic geology potential of a region based on the mineral and rocks existence.
7. describe the crystalline systems, the basic principles behind the arrangement of atoms to form crystal structures, and how these atoms are coordinated and bonded.
8. demonstrate how atoms interact to form minerals and how the structure and chemical composition of minerals determine the properties and occurrence of minerals.
9. explain how polarized and unpolarized light travels throughout crystals and the effects in color and other optical properties.

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

Goal 03 - Natural Science

1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted