Advanced Skill Certificate in Environmental Management for Mining

Waste Management and Mineral Processing

Acid Mine Drainage (AMD)

Acid mine drainage is the outflow of acidic water from mining sites, usually from the exposure of sulfide minerals to air and water. The process creates a solution of sulfuric acid, heavy metals, and other contaminants that can be harmful to the environment and human health.

Beneficiation

Beneficiation is the process of concentrating and upgrading the valuable minerals in an ore by removing the unwanted materials, or gangue. This is usually done through crushing, grinding, and separation techniques, such as flotation or magnetic separation.

Bioremediation

Bioremediation is the use of living organisms, such as bacteria or fungi, to break down or remove contaminants from the environment. In the context of waste management and mineral processing, bioremediation can be used to treat wastewater, remove heavy metals, or degrade organic pollutants.

Circular Economy

A circular economy is an economic system that is restorative and regenerative by design. It aims to keep resources in use for as long as possible, reduce waste and the use of new resources, and regenerate natural systems. In the context of mining, a circular economy could involve reusing and recycling mine waste, reducing energy and water consumption, and restoring mined land.

Comminution

Comminution is the process of reducing the size of a solid material, such as ore or waste rock, through crushing, grinding, or cutting. Comminution is a critical step in mineral processing, as it increases the surface area of the material, making it easier to separate the valuable minerals from the gangue.

Contamination

Contamination is the presence of unwanted substances, such as heavy metals, chemicals, or microorganisms, in the environment. Contamination can occur through mining activities, waste disposal, or other human activities, and can have negative impacts on human health and the environment.

Dewatering

Dewatering is the process of removing water from a solid material, such as waste rock or tailings. Dewatering is often necessary in mineral processing and waste management to reduce the volume of the

material, increase its stability, and facilitate transportation and disposal.

Dredging

Dredging is the process of removing sediment, debris, or contaminants from the bottom of a body of water. Dredging can be used to maintain navigable channels, restore wetlands, or extract minerals from underwater deposits.

Effluent

Effluent is the outflow of water from a treatment process, such as a wastewater treatment plant or a mineral processing facility. Effluent can contain contaminants, such as heavy metals or chemicals, that can be harmful to the environment and human health.

Geochemistry

Geochemistry is the study of the chemical composition and behavior of the Earth's materials, such as rocks, minerals, and water. Geochemistry is an important tool in mineral exploration, environmental monitoring, and waste management.

Heavy Metals

Heavy metals are metallic elements with a density greater than 5 g/cm3. Heavy metals, such as lead, mercury, and cadmium, can be toxic to humans and the environment, and can accumulate in the food chain.

Hydrometallurgy

Hydrometallurgy is the use of aqueous solutions to extract and process metals from ores or concentrates. Hydrometallurgical processes, such as leaching or precipitation, can be less energy-intensive and more environmentally friendly than traditional pyrometallurgical processes.

Leaching

Leaching is the process of extracting valuable minerals or metals from a solid material, such as ore or waste, using a liquid medium, such as water or a chemical solution. Leaching can be used to extract metals from low-grade ores, or to recover metals from waste or tailings.

Life Cycle Assessment (LCA)

Life cycle assessment is a method for evaluating the environmental impacts of a product, process, or service over its entire life cycle, from raw material extraction to disposal. LCA can be used to identify hotspots of environmental impact, inform decision-making, and improve the sustainability of mining and mineral processing operations.

Mineral Processing

Mineral processing is the separation and concentration of valuable minerals from gangue, or waste

materials. Mineral processing techniques include crushing, grinding, flotation, magnetic separation, and leaching.

Mine Waste

Mine waste is the solid or liquid material that is generated during mining and mineral processing activities. Mine waste can include waste rock, tailings, and effluent, and can contain contaminants that can be harmful to the environment and human health.

Overburden

Overburden is the layer of rock, soil, and other materials that covers a mineral deposit. Overburden must be removed before mining can begin, and can be a significant source of waste and environmental impact.

Phytoremediation

Phytoremediation is the use of plants to remove contaminants from the environment. In the context of mining, phytoremediation can be used to treat wastewater, remove heavy metals from soils, or restore mined land.

Pyrometallurgy

Pyrometallurgy is the use of high temperatures to extract and process metals from ores or concentrates. Pyrometallurgical processes, such as smelting or roasting, can be energy-intensive and produce emissions and waste.

Reclamation

Reclamation is the process of restoring mined land to a stable and sustainable state, often through the use of engineering, ecological, or biological techniques. Reclamation can include grading, contouring, planting, and erosion control measures.

Recycling

Recycling is the process of recovering and reusing materials from waste or discarded products. Recycling can reduce the need for new resource extraction, conserve energy, and reduce environmental impact.

Remediation

Remediation is the process of cleaning up or treating contaminated soil, water, or air. Remediation can be used to address historical contamination, or to prevent future contamination from mining or mineral processing activities.

Risk Assessment

Risk assessment is the process of identifying, evaluating, and prioritizing risks associated with a particular activity, process, or product. Risk assessment can be used to inform decision-making, mitigate potential

harm, and improve the safety and sustainability of mining and mineral processing operations.

Sedimentation

Sedimentation is the process of settling and accumulating particles or solids in a fluid medium, such as water or air. Sedimentation can be used to remove solids from wastewater, or to recover valuable minerals from tailings.

Sustainability

Sustainability is the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. Sustainability in mining and mineral processing involves balancing economic, social, and environmental considerations, and promoting responsible and efficient use of resources.

Tailings

Tailings are the solid or liquid waste materials that are generated during mineral processing activities. Tailings can contain valuable minerals, as well as contaminants that can be harmful to the environment and human health.

Waste Management

Waste management is the collection, transport, treatment, and disposal of waste materials. Waste management in mining and mineral processing involves minimizing waste generation, maximizing resource recovery, and protecting human health and the environment.

Water Management

Water management is the management and conservation of water resources, including the collection, treatment, distribution, and use of water. Water management in mining and mineral processing involves reducing water consumption, minimizing water loss and contamination, and protecting water quality and quantity.