EXECUTIVE EDUCATION MODULES ON RESPONSIBLE MINING

Training code	Module	Objective	Content	Duration (week)	Volume (hours)	ECTS	Tentative dates*	Prerequisites	Training location** (France)
MIRIS-TC-1	Welcome and homogenization courses	Basic geology and office automation tools	Introduction to the program and homogenization courses in the following areas: - Review of the basics of geology (mineralogy, petrography, stereographic projection and structural analysis) in preparation for the field trip; - Review of the basic office automation tools (Word, Excel, Power Point) in preparation for future scientific work and report writing; - Access to documentary resources: familiarization with Ecole des Mines bibliographic research tools; - Familiarization with Fontainebleau environment.	2	60	0	Early October	No prerequisites	Fontainebleau, France
MIRIS-TC-2	Field trip in geology, mining and environment	Understand the relationship between geology, mining and the environment	The aim of this field trip is to: - Study the fundamental geological concepts (mineralogy, rock classification, stratigraphy, tectonics) through geological mapping; - Cover a number of engineering geology topics (characterization and mechanical behavior of soils and rock masses, slope instability...); - Introduce the issues involved in exploiting mineral resources, with a visit to the Luzenac talc quarry; - Introduce the problem of mining sites' reclamation, with a visit to the MICA Environnement engineering office and the former open-cast coal mines at Graissessac.	1	30	2	Mid-October	No prerequisites	On the field
MIRIS-TC-3	Sampling: methodology and best practices	Learn the basic concepts and best practices of sampling	This module covers the following concepts: - Introduction to P. Gy's sampling theory; - Designing effective sampling protocols and procedures (QA Quality Assurance and QC Quality Control) with precision and accuracy; - Particularities of measurement and sampling: on the drilling site, in the laboratory, in the mine and in the plant.	1	30	2	End of October	No prerequisites	Fontainebleau, France
MIRIS-TC-4	Introduction to the various stages of the mining process	Provide an overview of the various stages in the mining process and the main methods and techniques used	This module covers the following aspects: - Knowledge of the mineral resources market and the main mining companies; - Main exploration and deposit modeling methods; - Main open-pit and underground mining methods; - Introduction to In-Situ Recovery mining method; - Main ore processing methods.	2	60	2	Early November	No prerequisites	Fontainebleau, France
MIRIS-TC-5	Economic evaluation of mining projects	Acquire the basic knowledge needed to carry out a complete economic evaluation of a mining project	This module covers the following aspects: - Main characteristics of mining investment, operating costs and revenues; - Cash flow calculation techniques; - Calculation of the economic indicators of a mining project (NPV, DR, IRR); - Impact of taxes and financing on the economics of a mining project; - Main parameters of a mining project: production rate and cut-off grade; - Carrying out a complete economic evaluation of a mining project based on case studies.	1	30	5	Mid-November	Basic mathematics	Fontainebleau, France
MIRIS-TC-6	Introduction to the environmental challenges of mining projects	Present the environmental and social challenges of mining activity	This module covers the following aspects: - Main environmental and social impacts of mining activity; - Environmental management in the mine life cycle, with examples of good and bad operational practices; - Introduction to geoenvironmental modeling, with tutorials; - Introduction to metal recycling, with technical and economic aspects.	1	30	2	Late November	No prerequisites	Fontainebleau, France
MIRIS-TC-7	Environmental and social impact assessment and management plan for mining projects	Define the issues and provide methodologies for environmental and social assessment in the mining project cycle	This module covers the following points: - Preliminary assessment phase and screening study; - Project risk scoping phase and scoping study; - Project technical description and baseline study; - Environmental and social impact assessment (ESIA) study; - Construction of an environmental and social management plan; - Resettlement of populations; - Mine closure plan.	0,6	18	1	Early December	No prerequisites	Fontainebleau, France
MIRIS-TC-8	Multi-stakeholder engagement and multi-agents managing systems	Understand the relationships between mining and surrounding stakeholders	This module covers the following points: - Stakeholder mapping; - Stakeholder engagement strategies; - Workshop on stakeholder engagement.	0,4	12	1	Early December	No prerequisites	Fontainebleau, France
MIRIS-TC-9	Introduction to recycling and the relationship between mines and the physical and human environment	Present the main challenges of recycling and how to approach the relationship between mines and their environment	This module covers the following points: - Introduction to the challenges of metal recycling and the main recycling processes, studying the main opportunities for the future; - Presentation of the concept of multi-agent systems and stakeholder mapping on an example of a mining project; - How to deal with relations between mines and communities and manage population displacements.	1	30	2	Mid-December	No prerequisites	Fontainebleau, France
MIRIS-TC-10	Principles and control of human risks and technical control of safety in the mining sector	Familiarize yourself with human and safety issues in the mining industry	This module covers the following points: - Principles and methodologies of control and management of social and human risks in the extractive industry; - Implementation of technical safety control and normative aspects in the extractive industry.	1	30	2	Mid-December	No prerequisites	Fontainebleau, France
MIRIS-TC-11	The business partners of the mining industry	Understand the role of business partners of the mining industry and the associated constraints and opportunities	This module covers: - The role of markets; - The role of banks; - Traceability in the mineral value chains; - Introduction to international standards.	1	30	0	Mid-December	No prerequisites	Fontainebleau, France
MIRIS-TC-12	Introduction to artisanal and small-scale mining	Understand the vastness of artisanal and small-scale mining, as well as the interactions with large-scale mining	This module covers: - An introduction of ASM; - A workshop on ASM and LSM; - Constraints and opportunities related to ASM.	0,4	12	0	Mid-December	No prerequisites	Fontainebleau, France
MIRIS-TC-13	Introduction to mining regulations	Understand the basics of mining regulation and mining tax systems	This module covers: - An introduction to mining regulation (compared international law expert); - An introduction to mining taxation systems.	0,4	12	0	Mid-December	No prerequisites	Fontainebleau, France
MIRIS-TC-14	Geopolitics of mineral resources	Introduction to the geopolitics of mineral resources in the context of the energy transition	This module covers the following concepts: - Extractive frontiers; - Different types of conflict; - Role of public policy; - Challenges for the 21st century and the anthropocene of resources.	1	30	2	Mid-January	No prerequisites	Fontainebleau, France
MIRIS-O1-1	Geomechanics and geotechnics	Concepts and methods for assessing the stability of open-cast and underground mining structures	This module covers the following points: - Soil and rock mechanics; - Classification of rock masses; - Slope deformation and failure mechanisms and slope stability calculation methods, with tutorials on dedicated software; - Cases of tailings piles and tailings dams; - Stability of underground structures: stress conditions around galleries, stability of chamber and pillar mines; failure mechanisms and mechanical reinforcement; type and installation of mechanical reinforcements; - Monitoring, instrumentation techniques and measurement analysis methods. This module might be structured in two parts, one on 2 weeks and a separated week on mini-projects.	3	90	6	Mid-January	Basic mathematics and physics	Fontainebleau, France

MIRIS-O1-2	Rock blasting and fragmentation	Acquire and master theoretical and practical skills in the fundamental mechanisms of rock fragmentation using explosives, based on the characteristics of the rock mass, with a view to sizing blast plans	This module covers the following points: - Drilling techniques and equipment; - Explosives and priming systems; - Basic concepts of fragmentation: actions of the explosive, shock and gas energy, transmission of energy to the rock mass, explosive-rock mass adaptation; - Dimensioning the shot plan: loading drilling plan and initiation sequence; - measurement of blasting efficiency and influence of blasting parameters on results; - Control of geometric blasting parameters; - Analysis and reduction of nuisances: vibrations, airwaves, projections.	1	30	2	February	Basic mathematics and physics	Fontainebleau, France
MIRIS-O1-3	Water and mining	Understand the relationships between mining and water, as a constraint and a resource	This module covers: - Underground hydraulics and interpretation of pumping operations for lowering the water table; - The basics of deep sea mining; - Understanding water as a critical resource for the future development of mining; - The basics of geochemistry (AMD).	1	30	0	February	No prerequisites	Fontainebleau, France
MIRIS-O1-4	Workshop on developing a mining project from exploration to production	Operate the various stages of a mining project on a virtual copper deposit, from exploration to planning.	This module covers: - Exploration: understanding the geological structure, determining the geometry and potential of copper mineralization by directing drilling campaigns; - Deposit modeling: implementing geometric modeling techniques to build a 3D geological model with SURPAC software; - Resource evaluation: use basic geostatistical techniques to evaluate mineral resources with ISATIS Neo software; - Pit optimization: determine the final project on the basis of an economic evaluation of mining operations with WHITTLE software; - Mine planning: carry out a draft of long- and medium-term mine planning.	5	150	6	February-March	Basic mathematics and physics, basic knowledge on the mining industry (as previously adressed in the MIRIS program)	Fontainebleau, France
MIRIS-O1-5	Equipment and fleet sizing for mining operations, dispatch and automation	Select and size a fleet of mining equipment according to deposit characteristics and open-pit or underground mining method	This module covers the following points: - Sizing a fleet of loading and transport equipment in open-pit and underground operations; - Mining machine tires: technology and management; - Belt conveyor transport: technology and sizing; - Dispatch system and production control; - Introduction to mine 4.0 and technological innovations ;	2	60	0	March	Basic knowledge on the mining industry (as previously adressed in the MIRIS program)	Fontainebleau, France
MIRIS-O1-6	Mining balances and reconciliation	Understand why mine balances are necessary to measure the effectiveness of planning and execution processes, and thus move towards operational excellence.	This module covers the following points: - Mining reconciliation: definition, why and when? Who are the reconciliation clients? - Identifying the useful data for establishing balances along the value chain; - Knowing and understanding the methodologies, tools and techniques for analyzing mining balances; - The benefits of reconciliation: measuring performance, improving deposit management, assisting strategic planning; - Defining the best practices to be implemented.	1	30	2	April	Basic knowledge on the mining industry (as previously adressed in the MIRIS program)	Fontainebleau, France
MIRIS-O1-7	Technical visits: quarries, mines, mining equipment manufacturers	Test your knowledge and skills in the field, refine your understanding of the technical and economic challenges of mining projects	Visits to open-pit and underground mining sites and mining equipment manufacturers in France and Europe	2	60	1	April	No prerequisites	France & Europe

Notes

* Dates may vary according to availability of expert speakers. Please contact the training team for exact dates.

** The course takes place face-to-face. **Distance learning is not possible**.

*** Field trip and technical visits are open to outsiders, but are subject to organizational and logistical constraints. Module fees depend on the program, which varies from year to year.