EMINReM Newsletter

1 Edition

Coordination meeting under the Erasmus+ EMINReM project at the Technical University Bergakademie Freiberg (Germany)

From May 2 to 6, 2023, a coordination meeting of the Erasmus+ EMINReM project partners was held at the Technical University Bergakademie Freiberg in Germany. The event gathered representatives of partner universities to discuss the current stage of project implementation and coordinate further joint activities. Special attention was paid to the development of the Master Programme in Eco-Mining and Innovative Natural Resources Management.

The participants reviewed key tasks related to curriculum design, project management, and cooperation between consortium members. The meeting also provided an opportunity to exchange experience with European partners in the field of sustainable mining education. This activity contributed to the project's broader goal of improving the quality of higher education in mining, environmental protection, and natural resources management. Overall, the meeting strengthened international cooperation within the EMINReM consortium and supported the further implementation of the project. The partners also discussed upcoming project activities and the distribution of responsibilities for the next stages. The meeting became an important step in ensuring the effective and coordinated implementation of the EMINReM project.

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EMINReM Newsletter

1 Edition

Resources Modelling and Evaluation: Course Overview

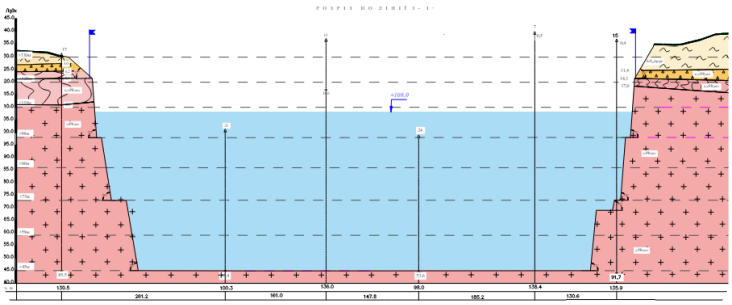

Fig. 1. An example of a geological map of mineral deposits

The course **"Resources Modelling and Evaluation"** focuses on the principles and practical tools for modelling geological and technological processes, particularly in the context of mineral exploration and mining. It introduces students to the basic concepts of modelling, including its purpose, principles, and stages, for analysing systems, forecasting behaviour, optimising processes, and reducing risks.

A major part of the course is devoted to working with data. Students learn about different data sources, formats, import procedures, and methods of preparing data for modelling. The course explains how geological, geodetic, surveying, experimental, and statistical data can be collected, processed, interpreted, and transformed into useful information for further analysis.

The course also covers mathematical and statistical modelling methods. Students study regression, correlation, analysis of variance, hypothesis testing, and experimental planning. Special attention is paid to both passive methods, which analyse already existing data, and active methods, which involve controlled experiments to determine optimal conditions and improve decision-making.

Another important block of the course deals with geological modelling and mapping. Students learn how to construct hypsometric plans, constant thickness plans, geological maps, maps of actual material, geological sections, and resource estimation plans.

Finally, the course introduces modern digital tools for 3D geomodelling and resource evaluation. It explains how software such as Surfer, ArcGIS, Leapfrog Geo, Petrel, RockWorks, and Datamine can be used to create accurate geological models, estimate valuable components, manage databases, assess environmental risks, and support efficient mineral extraction.

Overall, the course prepares students to use modelling as a practical instrument for resource assessment, mining planning, and sustainable decision-making in the mining industry.

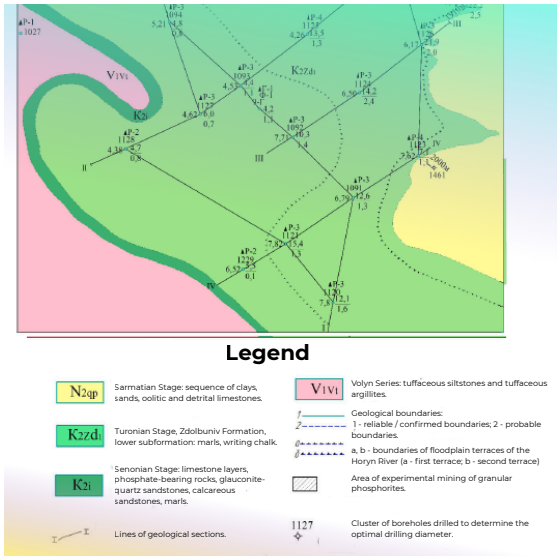

Fig. 2. An example of the geological map of the deposit with a map of the actual material

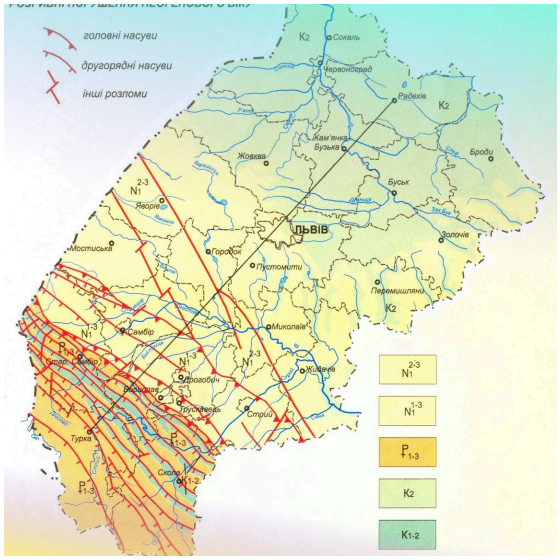

Fig. 3. An example of the geological map of the area

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EMINReM Newsletter

2 Edition

Sustainable Business and Project Management: Course Overview

Fig. 1. Sustainable Development Goals Compass

The course **"Sustainable Business and Project Management"** is delivered within the framework of the Erasmus+ EMINReM project and is designed for Master's students studying environmental protection technologies, resource saving in the mining and metallurgical complex, and ecology. The discipline focuses on the development of practical knowledge and skills needed to manage sustainable business processes and environmental projects in conditions of limited resources, uncertainty, and conflicting requirements. It combines theoretical foundations of sustainable development with practical approaches to project planning, environmental assessment, resource management, and public communication.

The main purpose of the course is to systematize and strengthen students' theoretical knowledge of sustainable business and project management, as well as to develop their ability to apply this knowledge to real-life environmental and industrial challenges. Students learn how to evaluate the sustainability of business activities, identify environmental risks, develop local environmental action plans, and justify practical solutions for the rational use of natural resources. The course also highlights the importance of legal and ethical standards in the development and implementation of environmental projects.

Another important component of the discipline is the development of local environmental action plans. Students explore the stages of preparing such plans, including data collection, problem ranking, stakeholder involvement, public discussion, and the selection of appropriate environmental technologies. Special attention is paid to the role of local communities, authorities, public organizations, and businesses in implementing environmental protection measures. The course also introduces students to indicators of national environmental policy effectiveness. Students examine how environmental, economic, and social indicators can be used to evaluate the progress of national and regional sustainability strategies. They also study how business processes can be adapted to national environmental policy requirements and European Union environmental standards.

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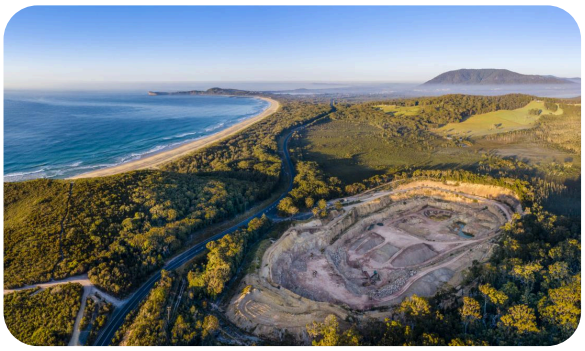
EMINReM Newsletter

2 Edition

Sustainable Business and Project Management: Course Overview

Practical project work is a key element of the course. Students develop and present projects related to renewable energy sources, resource- and energy-saving technologies, wastewater treatment, water management, and land reclamation. These topics help students apply project management tools to specific environmental challenges and assess the economic, ecological, and social effectiveness of proposed solutions.

The course pays particular attention to water and land resources management. Students analyze modern approaches to industrial and municipal wastewater treatment, river basin management, implementation of EU water policy principles, and the use of best available technologies to reduce pollution. They also study land use, reclamation of disturbed lands, soil monitoring, and post-war environmental recovery, which are especially relevant for Ukraine's sustainable development.



By the end of the course, students are expected to be able to apply legal and ethical norms in environmental project development, organize teamwork, manage personnel and resources, communicate project benefits and risks to the public, and conduct environmental expert assessments of business processes. They also develop the ability to prepare and present environmental projects at local, regional, national, and international levels.

Overall, "Sustainable Business and Project Management" strengthens students' professional competencies in sustainability-oriented decision-making, responsible business management, and environmental project implementation. Within the EMINReM project, the course contributes to the preparation of specialists who can combine ecological awareness, project management skills, and practical solutions for sustainable development in industrial and social sectors.

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EMINReM Newsletter

3 Edition

The first study visit of the EMINReM Project consortium to Kütahya Dumlupınar University (Türkiye)

The series of study visits within the framework of EMINReM Project has started from activities at Kütahya Dumlupınar University on the 20-24th of November 2023.

The Partner-Universities from Ukraine (Dnipro University of Technology and Zhytomyr Polytechnic State University), Kazakhstan (Kazakh National Research Technical University, Almaty) and Uzbekistan (Navoi State University of Mining and Technologies) were the activity participants.

The key direction of cooperation within the Project is capacity-building in higher education. The goal of the Study Visits is to get acquainted with the laboratory base of the European part of the Project Consortium, their teaching experience, and the peculiarities of the functioning of Virtual Learning Platforms for students' distance learning. The Partner best practices learned will be used for the development of the EMINReM Master Programme and for further students' training at the Partner Universities in Ukraine, Kazakhstan, and Uzbekistan.

The Consortium thanks the Host University – Kütahya Dumlupınar University, Prof. Oktay SHAHBAZ, and the Expert of IRD, Vehbi Onur DEMIRCILER, for organising a meaningful and interesting program and for comprehensive support during the Project implementation! We wish the Partnership a successful implementation of the Project and excellent performance in the assigned tasks.

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EMINReM Newsletter

3 Edition

Gamification in Eco-Mining: Course Overview

The course **"Gamification in Eco-Mining"** is delivered within the framework of the Erasmus+ EMINReM project and focuses on the use of digital technologies, serious games, virtual reality, and augmented reality in modern mining education. The discipline introduces students to innovative tools that can support the training and retraining of mining engineers, occupational safety specialists, environmental experts, and other professionals working in the mining sector.

The course combines theoretical knowledge with practical digital training. Students explore the history and development of gamification in mining, different types of professional and serious games, synthetic learning environments, and the role of VR/AR technologies in improving safety, operational awareness, and professional skills. Particular attention is paid to virtual models of underground and open-pit mining environments, interactive safety training, blasting procedures, land reclamation, and social license to operate.

Examples of games and digital learning environments introduced and used within the course include SIMS VR Mining Experience, Rock Barring in an Underground Mine, Critical Interventions for Safety, HAUL!, and Aim to Reclaim Virtual Lab. The course also presents the MiGaEL serious games package, including exercises on Charging/Blasting, Safety Card, Driving Departure, Safety Procedures Before and After Blasting, Stages of Drifting, and Social License to Operate in the Mining Industry. Depending on the teaching schedule, available equipment, and students' interests, selected games may be used during practical classes or assigned as part of independent work. Students are also introduced to synthetic learning environments for mine safety training, such as Harry's Hard Choices and Harry's Hazardous Day.

The practical part of the course allows students not only to test existing educational applications and serious games, but also to learn the basics of developing their own 3D, VR, and AR applications using platforms such as Unity. As a result, the course helps students understand how gamification can make mining education more interactive, realistic, safe, and attractive for future professionals.

Fig. 1. The relationships between games, video games, serious games and serious educational games

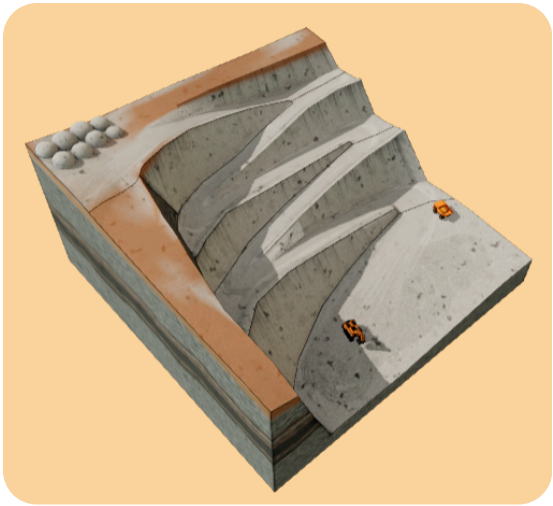

Fig. 2. An example from The Resource Rehabilitation Showcase

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EMINReM Newsletter

4 Edition

Environmental Assessment and Inventory Techniques for Mining Industry: Course Overview

Tier 1 default emission factors					
	Code	Name			
NFR source category	2.A.5.a	Quarrying and mining of minerals other than coal			
Fuel	NA				
Not applicable	NO_x, CO, NMVOC, SO_x, NH_3, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, HCH, PCBs, PCDD/F, Benzo(a)pyrene, Benzo(a)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB				
Not estimated					
Pollutant	Value	Unit	95 % confidence interval		Reference
			Lower	Upper	
TSP	102	g/Mg mineral	50	200	Visschedijk et al. (2004)
PM_{10}	50	g/Mg mineral	25	100	Visschedijk et al. (2004)
$PM_{2.5}$	5.0	g/Mg mineral	2.5	10	Visschedijk et al. (2004)

Fig. 1. Emission factors for source on Quarrying and mining of minerals

The course **"Environmental Assessment and Inventory Techniques for Mining Industry"** is delivered as part of the Erasmus+ EMINReM project and is designed for Master's students in Ecology and Environmental Protection Technologies. The discipline focuses on modern methods for identifying, inventorying, assessing, and monitoring pollution sources associated with mining enterprises.

The course introduces students to the main technological processes of mineral extraction and processing, including open-pit and underground mining, drilling and blasting, excavation, transportation, dumping, and mineral processing. Special attention is paid to the specific environmental impacts of mining activities on air, water, land resources, landscapes, ecosystems, and public health.

A significant part of the discipline is devoted to classifying and inventorying air pollution sources at mining enterprises. Students learn to identify stationary, mobile, point, linear, and area emission sources; determine their technological characteristics; calculate gross emissions; and assess sanitary protection zones. The course also introduces mathematical methods and models used to calculate air pollution parameters and predict pollutant dispersion in the atmosphere.

The course also covers the instrumental control and regulation of air pollution in accordance with Ukrainian legislation and European Union standards, including approaches set out in Directive 2008/50/EC on ambient air quality. Students study air quality indicators, pollution indices, environmental monitoring systems, and methods for identifying health risks in areas affected by mining emissions.

Overall, "Environmental Assessment and Inventory Techniques for Mining Industry" develops students' ability to conduct environmental assessments of mining enterprises, prepare inventories of pollution sources, apply modelling and monitoring techniques, and propose measures to reduce negative environmental impacts. The discipline prepares future specialists to work with complex environmental data and support the sustainable, safe, and responsible development of the mining industry.

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EMINReM Newsletter

4 Edition

Introduction to the Circular Economy, Economics and Management of Natural Resources: Course Overview

Fig. 1. Waste hierarchy pyramid

The course **"Introduction to the Circular Economy, Economics and Management of Natural Resources"** is delivered within the framework of the Erasmus+ EMINReM project and is designed for Master's students of the educational programme "Ecology". The discipline provides students with a multidisciplinary understanding of circular economy principles, sustainable resource management, and the economic role of natural resources in modern societies.

The course introduces students to the key differences between linear and circular economic models. Particular attention is paid to the transition from the traditional "take-make-dispose" model to circular systems based on reducing waste, extending product life cycles, reusing materials, recycling resources, and designing products for durability, repair, and recovery. Students learn how circular economy principles can reduce pressure on natural resources, support innovation, and create environmental, economic, and social benefits.

A significant part of the discipline is devoted to circular economy action areas, including production, consumption, waste management, secondary raw materials, eco-design, circular design, and innovation. Students also analyse EU and Ukrainian waste policies, build a waste hierarchy pyramid, and compare different approaches to sustainable product design.
The second part of the course focuses on the economics and management of natural resources. Students study the classification of renewable and non-renewable resources, resource depletion, externalities, valuation methods, and sustainable resource management strategies. Special attention is paid to environmental policy, international agreements, and instruments that support the responsible use of natural resources.

The practical component includes individual and team-based tasks. Students analyse the role of natural resources in the economies of selected European countries, assess waste generation and recycling levels, and present modern technologies used for waste recycling and resource management.
Overall, the course prepares students to critically assess circular economy models, choose appropriate natural resource management strategies, and apply sustainable approaches in environmental and economic decision-making. Within the EMINReM project, it contributes to the training of specialists capable of supporting eco-mining, circular business practices, sustainable resource use, and innovative environmental transformation.

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EMINReM Newsletter

5 Edition

Study visit of the EMINReM Project consortium to the Technical University Bergakademie Freiberg (Germany)

On the 25th to 29th of March 2024, the working team of the EMINReM Project visited the Technical University Bergakademie Freiberg (TU BAF) within a planned Study Visit.
The Partner-Universities from Ukraine (Donetsk National Technical University, Dnipro University of Technology, Zhytomyr Polytechnic State University), Kazakhstan (Kazakh National Research Technical University, Almaty) and Uzbekistan (Navoi State University of Mining and Technologies) were the activity participants.

Each Partner representative presented the curricula of educational programs planned for modernisation during the Project implementation and discussed other issues important to the Project's success.
Prof. Karsten DREBENSTEDT and Prof. Sabrina HEYDRICH presented the Mining curricula of the Host University and shared their teaching experience, which will be applied to the Partner curricula modernisation. In addition, presentations were made on providing remote distance learning at TU BAF through a Virtual Platform and on ensuring the accreditation procedure and quality control of the educational process at German Higher Education Institutions. The participants became acquainted with the scientific and technical base of the Host University, visited the laboratories of rock mechanics, biochemistry, IT, and virtual/augmented reality, and the educational and laboratory mine of the University “Reiche Zeche”. Under the leadership of Prof. Helmut MISCHO the participants descended to a depth of 140 m and directly observed the underground mining processes.

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EMINReM Newsletter

5 Edition

Study visit of the EMINReM Project consortium to the Jaén Higher Polytechnic School (Spain)

From the 1st to the 5th of April 2024, the working team of the EMINReM Project visited the Jaén Higher Polytechnic School (UJAEN) as part of a planned Study Visit. The Partner-Universities from Ukraine (Donetsk National Technical University, Dnipro University of Technology, Zhytomyr Polytechnic State University – the main Project Coordinator and Grant Holder), Kazakhstan (Abylkas Saginov Karaganda Technical University), and Uzbekistan (Tashkent State Technical University named after Islam Karimov) were participants in the activity.

The Partner representatives presented the curricula of educational programs planned for modernisation during the Project implementation and discussed other issues important to the Project's success. The Director of the School, Prof. Manuel Valverde Ibáñez, welcomed all the participants on behalf of UJAEN. Prof. Francisco Antonio Corpas Iglesias, Assoc. Prof. Francisco De Borja Diaz Cabezas and Prof. Francisco Javier Iglesias Godino presented the curricula of the specialities “Mining”, “Construction” and “Extraction and processing of materials” of the Host University and shared their teaching experience, which will be applied to the Partner curricula modernisation of the Mining and Environmental Protection profile.

In addition, presentations were made on providing remote distance learning at UJAEN through a Virtual Platform, and on ensuring the accreditation procedure and quality control of the educational process at Spanish Higher Education Institutions.

The participants became acquainted with the scientific and technical base of the Host University and visited the laboratories of materials science, rock mechanics, engineering mechanics, and biochemistry.

On the last day of the activities, the delegation of Partner Universities held a meeting with the management of the Department of International Cooperation of UJAEN – the Head of the International Mobility Department, Prof. Miriam Montserrat Cano Rubio and Vice-Rector for International Relations, Prof. Jose Ignacio Jimenez Gonzalez. The parties discussed the further implementation of the EMINReM Project, as well as other opportunities for the development of international cooperation.

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EMINReM Newsletter

5 Edition

Coordination Meeting and Staff Training within the EMINReM Project at Technical University Bergakademie Freiberg

From April 22 to May 3, 2024, a coordination meeting and a series of staff training sessions were held at TU Bergakademie Freiberg (Germany) on the modernisation of mining curricula. Master students` training within developed curricula will begin in the 2024/2025 academic year at partner HEIs involved in the EMINReM Project.

The key motivation behind such modernisations is to increase the efficiency and environmental friendliness of mining operations, thanks to the application of advanced knowledge of a new generation of mining engineers for mining industry impact minimisation on the environment, which is an urgent challenge for the EU, Ukraine, Kazakhstan and Uzbekistan on the way to climate neutrality defined in the European Green Deal.

3 participants from each of the 7 partner-country universities took part in the staff training. These staff members represented the profile Departments at which the developed curricula will be taught.

Prof. Carsten Drebenstedt (TU Bergakademie Freiberg), Prof. Francisco De Borja Diaz Cabezas, Prof. Francisco Antonio Corpas Iglesias (University of Jaen, Spain), Prof. Enes Zengin, Prof. Oktay Şahbaz and Prof. Kaan Erarslan (Kutahya Dumlupinar University, Turkey) acted as trainers. The coordinator of the National Erasmus+ Office in Ukraine, Svitlana Shytikova, also delivered a welcome speech at the Coordination Meeting.

In addition, the participants became acquainted with the educational and laboratory base of the Host University, including the laboratory mine “Reiche Zeche” and the laboratory for IT and virtual/augmented reality, some of whose developments will be implemented in the educational process at partner-country Universities.

EMINReM consortium sincerely thanks the Host University and, in particular, Prof. Carsten Drebenstedt for organising a meaningful and interesting program, as well as the lecturers from the University of Jaen and Kutahya Dumlupinar University for providing a large volume of innovative materials for Master students training!

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EMINReM Newsletter

6 Edition

Industrial Waste Management, Resource Recovery and Recycling Technologies: Course Overview

The course **“Industrial Waste Management, Resource Recovery and Recycling Technologies”** is delivered within the framework of the Erasmus+ EMINReM project and is designed for Master’s students of the educational programme “Ecology”. The discipline provides students with knowledge of sustainable industrial waste management, recycling, and resource recovery as key elements of environmental protection and circular economy practices.

The discipline gives students an understanding of how industrial waste is generated, classified, collected, transported, stored, treated, recycled, and disposed of. Particular attention is given to waste produced by mining, metallurgical, chemical, and other industrial enterprises, as well as to the risks associated with hazardous waste and uncontrolled accumulation of industrial residues.

The course combines environmental, technological, and regulatory aspects of waste management. Students become familiar with waste classification systems, waste codes, hazard categories, waste passports, and waste-generation standards. They also analyse the main principles of waste management in Ukraine and the European Union.

A separate focus is placed on resource recovery and recycling technologies. The course introduces mechanical, chemical, and biological recycling methods, waste-to-energy solutions, and modern approaches to recovering valuable materials from industrial waste. It also highlights the growing role of digital tools, including IoT and AI, in improving the efficiency of waste sorting, processing, and recycling.

By the end of the course, students gain the knowledge and practical skills needed to assess industrial waste problems, compare possible processing methods, and propose more sustainable waste management solutions.

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EMINReM Newsletter

6 Edition

Clean Technologies for Open-Pit Mining: Course Overview

Fig. 1. Commissioning of a cyclic flow stripping complex (CPVC) at the Vostochny section

The course **"Clean Technologies for Open-Pit Mining"** is delivered under the Erasmus+ EMINReM project and focuses on modern technological solutions to improve the efficiency, safety, and environmental performance of open-pit mining operations. The discipline introduces students to cleaner approaches to mineral extraction, with particular attention to transport systems in deep and ultra-deep quarries. A key focus of the course is the use of cyclic-flow technology (CPT) and combined transport systems, including automobile, conveyor, and railway transportation.

Students study how the optimal placement of conveyor complexes, transhipment points, and steeply inclined conveyors can reduce the lifting height and haulage distance for dump trucks in deep open pits.

The course also examines how cleaner transport technologies can help solve major operational and environmental challenges in open-pit mining. By reducing the dependence on heavy dump trucks, such systems can lower fuel consumption, decrease dust and exhaust gas emissions, improve traffic organisation in confined quarry conditions, and support more efficient development of deep mining horizons.

An important part of the discipline is connected with technical and economic justification. Students analyse models for determining the optimal depth and location of conveyor systems, compare different transport schemes, and assess their impact on mining productivity, investment payback, and overall transportation costs. Special attention is paid to the practical application of these methods in deep iron ore open pits.

Overall, the course prepares students to understand and evaluate clean technological solutions for open-pit mining. It develops their ability to analyse mining transport systems, justify the use of conveyor-based technologies, and support decisions to reduce environmental impact while maintaining the economic efficiency of mineral extraction.

Fig. 2. Conveyor lift at the stripping works of the «Vostochny» section

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EMINReM Newsletter

7 Edition

The 3rd coordination meeting and international conference on the Erasmus+ EMINReM project at Kutahya Dumlupinar University (Turkey)

From October 14 to 16, 2024, the 3rd coordination meeting and international conference took place within the framework of the Erasmus+ project ERASMUS-EDU-2022-CBHE-STRAND-2-101082621 “Master Program in Eco-Mining and Innovative Natural Resources Management” in the field of “Higher Education Capacity Building”. The meeting was held at the project’s partner university, Kütahya Dumlupinar University (Kütahya, Türkiye).

This university was founded in 1992 and is one of the youngest universities in Turkey. Today, it has more than 50,000 students, including more than 2,000 international students. The University’s motto “Adding Value to the Future” is aimed at developing research skills and self-developing personalities. The university campus impresses with its national-style architecture and a spacious area featuring numerous faculty buildings, dormitories, and sports facilities.

All conference participants made presentations on the development of master’s programs in eco-mining and innovative natural resource management. Representatives of the University of Kutahya Dumlupinar familiarised the partners with the educational and scientific laboratories of the Faculty of Mining Engineering, which are equipped with modern research technologies.

The main outcome of the EMINReM visit to Kutahya Dumlupinar University was further partnership cooperation within the project to develop teaching and learning materials on eco-mining and natural resource management.

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EMINReM Newsletter

7 Edition

Problems and Innovations in the Process Chain of Mineral Resources: Course Overview

The course **“Problems and Innovations in the Process Chain of Mineral Resources”** focuses on the economic and managerial transformation of the mining sector. It is designed for Master’s students in Mining Engineering and addresses one of the key challenges of modern mineral resource development: how mining companies can move beyond the simple extraction and sale of raw materials towards more integrated, innovative, and value-oriented operating models.

The discipline examines the entire value chain of mineral resources, with particular attention to the role of vertical integration in improving the efficiency of mining companies. Students learn how the connection between extraction, processing, production, and sales can help companies create greater added value, reduce dependence on raw material price fluctuations, and ensure more stable development in a changing global market.

A central theme of the course is the development of vertically integrated mining companies and the balanced use of their strategic advantages. The course explores how innovation, corporate social responsibility, technological complexity, intangible assets, and effective management decisions influence the competitiveness of mining enterprises. Students also study the factors that limit the development of mining companies and consider possible ways to overcome these challenges.

During the course, students work with practical topics related to the selection of vertical integration models, assessment of innovation-driven changes, analysis of business segments, and development of programmes aimed at improving the efficiency of mining companies. This allows them to connect theoretical approaches with real economic and strategic decisions in the mining industry.

As a result, the course helps students understand the mineral resources sector not only as a technological field, but also as a complex value chain that requires strategic thinking, innovation, responsible management, and long-term planning. It prepares future specialists to evaluate development options for mining enterprises and propose solutions that strengthen efficiency, competitiveness, and sustainability across the entire process chain.

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EMINReM Newsletter

8 Edition

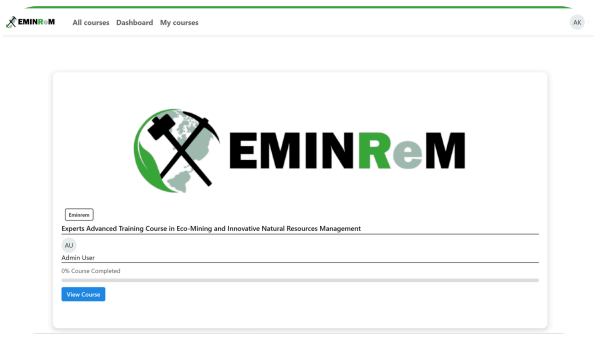
Enrolment open for the EMINReM Experts Advanced Training Course!

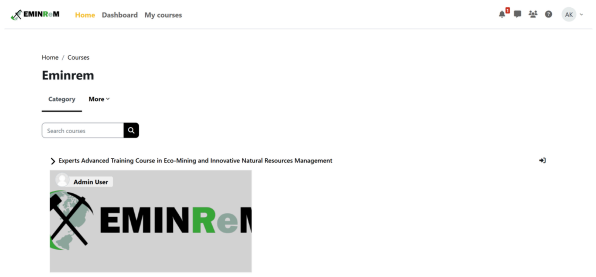
Do you want to gain cutting-edge knowledge in sustainable mining, resource conservation, and environmental management? Are you looking for an opportunity to upgrade your qualifications? Would you like to receive a European-standard certification?
Join the free online course – EMINReM Experts Advanced Training **"Eco-Mining and Innovative Natural Resources Management"** (EMINReM EAT)!
This course provides in-depth knowledge and practical skills in eco-mining and innovative natural resource management. You will explore:

- Modern Approaches to Natural Resource Management and Entrepreneurship in Mining
- Clean Technologies for Mineral Extraction and Processing
- Waste Management and Recycling Technologies in the Mining Industry
- Resource Modelling, Environmental Auditing, and Impact Assessment

Course structure:

- Module 1: Innovation, Entrepreneurship, and Natural Resource Management
- Module 2: Advanced Mineral Extraction and Processing Technologies
- Module 3: Waste Management and Recycling Technologies
- Module 4: Resource Modeling, Environmental Auditing, and Impact Assessment





Learning format and duration:
Flexible online learning – participants can complete the course at their own pace.
Estimated duration: 200 study hours (10 ECTS), with 4 months to complete the course.
Includes: Video lectures, study materials, practical assignments, and interactive discussions.
Certification: Successful participants will receive an official qualification certificate within the EMINReM Project!

How to register?
Fill out the registration form here: https://docs.google.com/forms/d/1_isSng2BFYnhK9b3LSgdci9etpXuZS3g8IzP4EwjB4E/edit?pli=1&pli=1
Once the required number of participants is reached, you will receive a confirmation email and access to the course!
Don't miss the chance to expand your expertise and earn a valuable international certification!
Join now and stay ahead in the field of sustainable mining!

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EMINReM Newsletter

8 Edition

Mineral Resources Exploration and Assessment: Course Overview

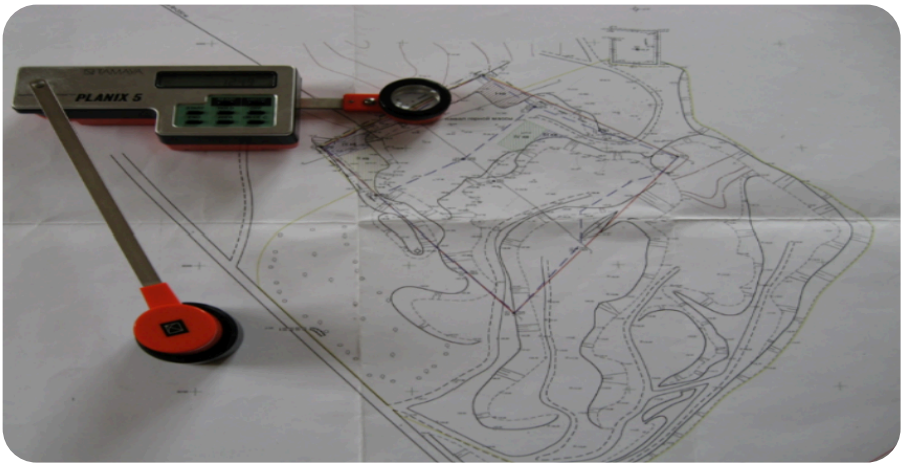

Fig. 1. Calculation by coordinates of corner points

Modern mining begins long before extraction. Before a deposit can be developed, it must be discovered, studied, evaluated, and justified from both geological and economic perspectives. The course **"Mineral Resources Exploration and Assessment"** introduces Master's students to this complex process and shows how geological data are transformed into reliable decisions about the industrial value of mineral deposits.

The course is centred on the full exploration cycle: regional geological studies, mineral resource forecasting, prospecting, evaluation work, field exploration, and operational exploration during deposit development. Students learn how each stage contributes to reducing uncertainty, improving the reliability of geological information, and supporting the rational use of subsurface resources.

Fig. 2. Drilling of inclined wells

Particular attention is given to the methods geologists use to study mineral deposits. The discipline covers geological mapping, drilling, mine workings, geophysical and geochemical studies, sampling, exploration networks, and deposit modelling. Students examine how the choice of exploration methods depends on the size, shape, depth, structure, and variability of mineral bodies.

Another key focus of the course is the assessment of mineral resources and reserves. Students study reserve classifications, contouring and blocking of mineral bodies, reserve calculations, assessment parameter determination, and analysis of potential errors in estimation. This allows them to understand not only how reserves are calculated, but also how reliable these calculations are for future mining decisions.

By completing the course, students develop the ability to interpret geological exploration results, assess the quality and quantity of mineral resources, identify risks connected with incomplete data, and prepare a scientifically grounded basis for geological and economic evaluation. The discipline strengthens their professional readiness to work in mineral exploration, resource assessment, and sustainable subsurface management.

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8 Edition

Rational Use of Mineral Resources: Course Overview

The course **"Rational Use of Mineral Resources"** is designed for Master's students in Mining and focuses on the responsible management of mineral resources in modern industrial conditions. The discipline considers mineral resources not only as an economic asset but also as a finite natural resource base for long-term development, requiring careful planning, efficient extraction, environmental protection, and social responsibility.

The course introduces students to the key principles of rational resource use, including economic efficiency, environmental safety, integrated development of deposits, technological efficiency, and sustainable development. Students examine how mineral resources can be used to maximum benefit with minimal negative impact on the environment, while also taking into account the interests of local communities and future generations.

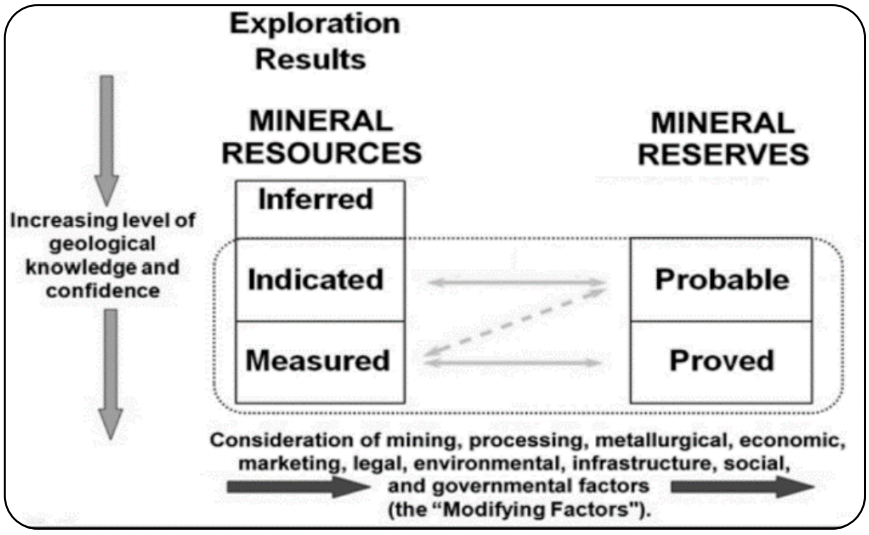

Fig. 1. General relationship between Exploration Results, Mineral Resources and Mineral Reserves

A substantial part of the course is devoted to the assessment and development of mineral deposits. Students explore geological assessment, exploration methods, geological mapping, 3D modelling, reserve estimation, and the economic evaluation of mining projects. The course also covers financial indicators such as NPV, IRR, payback period, CAPEX and OPEX, which help determine whether a mining project is economically feasible. The discipline also addresses modern mining and processing technologies.

Students study automation, robotisation, artificial intelligence, drones, precision blasting, electric and hybrid mining equipment, modern open-pit and underground mining methods, and mineral processing and enrichment technologies. Particular attention is given to technologies that improve productivity, reduce waste, increase safety, and minimise environmental impact.

Environmental and legal aspects are also central to the course. Students analyse the influence of mining on landscapes, water resources, air quality, ecosystems, and local communities. They also become familiar with environmental management principles, land reclamation, international standards, legal regulation, and approaches to reducing negative impacts throughout the life cycle of mining projects.

Overall, "Rational Use of Mineral Resources" prepares students to make balanced technical, economic, environmental, and managerial decisions in the mining sector.

The course develops the ability to assess mineral resource projects comprehensively, to introduce innovative and sustainable technologies, to manage risks, and to contribute to the responsible development of the mining industry.

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EMINReM Newsletter

9 Edition

Professor Karsten DREBENSTEDT's Visit to Zhytomyr Polytechnic as Part of the Erasmus+ EMINReM Project

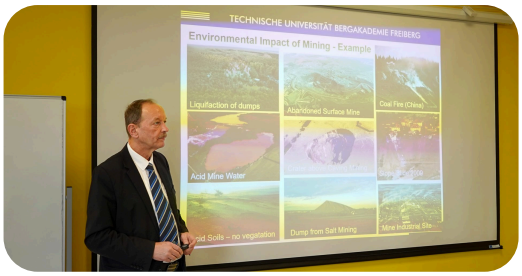
From March 3 to March 7, within the framework of the Erasmus+ EMINReM project, Professor Karsten Drebenstedt from the Technical University Bergakademie Freiberg (TUBAF) (Germany) visited Zhytomyr Polytechnic State University (ZPSU) to deliver lectures for students specialising in mining and environmental sciences for the second time.

Professor Karsten Drebenstedt is the Director of the Institute of Mining and Specialised Construction and a leading expert in mining technologies.

His visit program included a series of meetings with students, postgraduate researchers, and ZPSU scientists. The Professor introduced TUBAF's academic and research activities, provided insights into opportunities within the EMINReM project, and delivered lectures to students in environmental and mining disciplines. His lectures covered innovative ecological methods for mineral extraction, land reclamation technologies, and their subsequent use to meet societal and ecological needs.

In addition to lectures, meetings were held with the University administration, faculty members, and researchers of ZPSU. The discussions focused on prospects for international collaboration, the development of joint research projects, and exploring opportunities for student and faculty academic mobility.

During his visit, Professor Drebenstedt familiarised himself with the laboratory facilities of the Faculty of Mining, Environmental Management and Construction, which have been upgraded in part due to the EMINReM project.



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9 Edition

Training session for Erasmus+ EMINREM project experts at Tashkent State Technical University named after Islam Karimov (Uzbekistan)

A training session for experts of the Erasmus+ project ERASMUS-EDU-2022-CBHE-STRAND-2-101082621 EMINReM project “Master Program in Eco-Mining and Innovative Natural Resources Management” in the field “Higher Education Capacity Development” was recently held at the Tashkent State Technical University named after Islam Karimov (Uzbekistan).
The 4th coordination meeting of partners was held during the session. The event took place at one of the largest technical universities in Central Asia, Tashkent State Technical University named after Islam Karimov. The meeting was attended by 19 experts representing 10 partner universities from 6 countries: Germany, Spain, Turkey, Kazakhstan, Uzbekistan and Ukraine.

The purpose of the training session was to strengthen the professional capacity of teachers and practitioners in the field of clean industrial technologies, innovations, entrepreneurship and natural resource management, discuss modern teaching methods and introduce innovative approaches to sustainable environmental management. The participants of the meeting listened with great interest to the presentations of Professor **Karsten Drebenstedt**, Director of the Institute of Mining and Special Construction of the Technical University Bergakademie Freiberg (Germany), Professor **Oktay Şhahbaz** from from Dumlupinar University (Kütahya, Turkey) and Professor Francisco de Borja from the University of Jaén (Linares, Spain).
As part of the event, the 4th coordination meeting of the project partners was held under the leadership of EMINReM project coordinator Vasyl Mamray (Zhytomyr Polytechnic State University), where the results of the work packages, compliance with equipment procurement plans, coordination of current activities, planning of student mobility, and further steps to develop and implement master’s programs were discussed.
The partners exchanged experiences, presented project developments, and discussed strategic challenges of sustainable natural resource management in the face of global change.

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10 Edition

Prevention of the Water Resources Contamination in the Extraction of Natural Stone and Ore: Course Overview

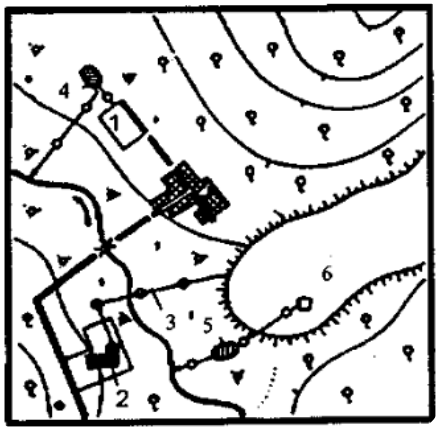

Fig. 1. Site plan: 1 - mine; 2 - processing plant; 3 - pulp pipeline; 4 - mine water treatment facilities; 5 - treatment facilities for wastewater from the water processing plant; 6 - settling tank; 7 - settlement

The course **"Prevention of the Water Resources Contamination in the Extraction of Natural Stone and Ore"** focuses on one of the key environmental challenges of the mining industry — protecting water resources from pollution caused by mining, quarrying, ore extraction, and mineral processing activities. The discipline helps students understand how wastewater is formed at mining enterprises, what its composition and properties are, and how it affects the environment. Students study different types of mining wastewater, including mine water, quarry and drainage waters, industrial and technological wastewater, and wastewater from processing plants.

The course also covers methods for minimising mine water, water-saving technologies, and approaches to reducing the negative impact of contaminated water on ecosystems and surrounding territories.

A significant part of the course is devoted to wastewater treatment technologies. Students become familiar with filtration processes, desalination of mineralised mine and quarry waters, purification technologies for coal processing plants, and the use of flocculants, coagulants and other water treatment chemicals. The discipline also introduces modern solutions for mining wastewater treatment and resource recovery.

The practical component of the course develops students' ability to apply theoretical knowledge to real engineering tasks. Practical classes include topics such as enhanced biological phosphorus removal, biological sulphate reduction, biological nitrogen removal, aerobic organic matter removal and off-gas emission tests. Students also learn to calculate key parameters of machines and reagent consumption in wastewater treatment processes.

By completing this course, students develop the ability to analyse water contamination problems in mining and metallurgical production, evaluate wastewater treatment methods, and propose environmentally sound and cost-effective solutions. The discipline strengthens their readiness to contribute to sustainable mining, water resource protection, circular economy principles and responsible industrial development.

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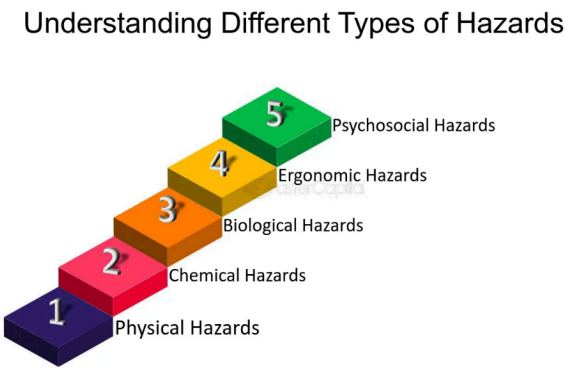
EMINReM Newsletter

10 Edition

Implementation of Risk Assessment Methods for Occupational Health and Safety: Course Overview

The course **"Implementation of Risk Assessment Methods for Occupational Health and Safety"** focuses on preventing workplace accidents, injuries, and occupational illnesses through the systematic identification, assessment, and management of risks. The discipline is especially relevant for mining and industrial workplaces, where employees may be exposed to physical, chemical, biological, ergonomic, psychosocial and production-related hazards.

Students study the key terminology and fundamentals of occupational safety and health, basic OSH regulations, hazard identification methods, and the main principles of risk assessment. Particular attention is paid to risks in mining environments, including dust, hazardous gases, diesel exhaust, noise, vibration, heat stress, ionising radiation and other factors that can affect workers' health and safety. The course introduces students to ISO 45001 and the role of occupational health and safety management systems in creating safer working conditions.



Students learn how leadership, worker involvement, legal compliance, operational controls, emergency preparedness, performance evaluation and continuous improvement contribute to effective risk management in the workplace. A significant part of the course is devoted to practical risk analysis methods. Students become familiar with qualitative, quantitative and semi-quantitative approaches, including checklists, Preliminary Hazard Analysis, HAZOP, SWIFT, Bow Tie Analysis, Decision Tree Analysis, risk matrices, expert assessment, ranking methods, Monte Carlo simulation and other tools used to evaluate the probability and impact of risks.

The practical and e-learning components include case study analysis, quizzes, forum discussions, individual tasks and team-based activities. Students learn how to identify hazards, determine who may be harmed and how, evaluate the level of risk, select appropriate control measures, document findings, and monitor or review risk assessments when workplace conditions change.

Upon completion of the course, students develop the ability to apply risk assessment methods to real occupational safety problems, especially in mining and industrial contexts. The discipline strengthens their readiness to create safer working environments, support a culture of prevention, communicate effectively on safety issues, and make informed decisions aimed at protecting workers' health and well-being.

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10 Edition

Advanced Mineral Processing for Eco-Mining: Course Overview

The course **“Advanced Mineral Processing for Eco-Mining”** focuses on modern approaches to mineral extraction, processing and environmental protection in the mining industry. It introduces students to advanced methods of using mineral resources more efficiently while reducing the negative environmental impact of mining and processing activities.

Students study the rational use and protection of subsoil resources, ecological principles of mining, and modern technologies for the extraction and primary processing of mineral raw materials. Particular attention is paid to rare and radioactive metal ores, integrated use of mineral resources, open-pit and underground mining methods, geotechnological processes, and environmentally responsible approaches to mineral development.

The course also covers advanced mineral processing technologies used at processing plants. Students become familiar with modern ore processing methods, low-waste and waste-free technologies, closed production cycles, biotechnology applications in mining, and technological measures to reduce harmful emissions into the atmosphere. The discipline also highlights the importance of Best Available Technologies, energy and water savings, and resource-efficient management of raw materials in modern mineral processing.

Fig 1. Deep well drilling rig

Fig 2. Loading and delivering machine Atlas Copco

The practical component helps students apply theoretical knowledge to engineering and environmental tasks. Practical classes include calculations related to land disturbance and reclamation, emissions from unorganised sources, air quality in and around quarries, groundwater inflow, wastewater systems, settling tanks, and purification of quarry waters. These tasks allow students to connect technological decisions with environmental monitoring, pollution control and the assessment of mining impacts on land and water resources.

As a result of the course, students develop the ability to assess environmental impacts of mining operations, apply resource-efficient processing approaches, use modelling tools, and propose technical, organisational, and economic measures for environmental protection. The discipline strengthens their readiness to work with sustainable mineral processing technologies, eco-mining solutions and responsible management of natural resources.

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EMINReM Newsletter

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Coordination Meeting of the Erasmus+ Project EMINReM at the University of Jaén, Spain

During October 20–24, within the framework of the Erasmus+ Project “EMINReM – Master Programme in Eco-Mining and Innovative Natural Resources Management”, a joint event took place at the Higher Polytechnic School of Linares, University of Jaén (Spain) – the 5th Coordination Meeting combined with the Final Seminar.

The event brought together representatives of the consortium universities and members of the project’s coordination committee from Ukraine, Kazakhstan, Uzbekistan, Germany, Türkiye, and Spain.

During the coordination meeting, the consortium partners summarised the previous stages of the Project's implementation, presented progress reports, and showcased the results achieved.

The responsible partner institutions – Kütahya Dumlupınar University (Türkiye) and Zhytomyr Polytechnic State University (Ukraine) – presented the Virtual e-Learning Platform (VeLP) https://velp.eminrem.ztu.edu.ua, which will be used to deliver professional training courses for university lecturers, business representatives, industry professionals, and public sector employees in the thematic fields of the Project.

The meeting also outlined the current tasks and future plans for the Project’s continuation and sustainability.

An important part of the program was the visit to several research and industrial enterprises collaborating with the University of Jaén. Participants had the opportunity to explore production facilities specialising in metal processing, laser prototyping, 3D modelling, and additive manufacturing (3D printing).

The consortium members expressed their sincere gratitude to the host institution – the Higher Polytechnic School of Linares, University of Jaén – for the excellent organisation and warm hospitality. Special thanks were extended to Prof. Sebastián García-Galán, Prof. Francisco Antonio Corpas Iglesias, Prof. Francisco Javier Iglesias-Godino, and Prof. Manuel Valverde Ibáñez for their invaluable contribution to the success of the event.

The partners look forward to the continued successful implementation of the EMINReM Project and further fruitful cooperation within the consortium.

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EMINReM Newsletter

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Creativity, Innovation, Leadership and Entrepreneurship: Course Overview

The course **"Creativity, Innovation, Leadership and Entrepreneurship"** focuses on developing creative thinking, entrepreneurial initiative, innovation management skills, and leadership competencies. It helps students understand how new ideas emerge, how they can be transformed into innovative products, services, or business models, and how effective leadership supports the successful implementation of these ideas in practice.

The course introduces students to the main concepts of innovation, innovative activity, innovative organisations, and innovative development.

Students explore different types of innovations, innovation strategies, innovation market infrastructure, technology transfer, intellectual property, and the role of innovation in increasing the competitiveness of firms and economies. Special attention is paid to the connection between creativity and innovation, as creative thinking is considered a key basis for generating valuable and practical ideas.

An important part of the discipline is devoted to entrepreneurship and business development. Students study the basic principles of entrepreneurship, the specific features of innovative enterprises, sources of financing for start-ups, venture capital, investment readiness, and the challenges faced by new businesses at different stages of growth.

The course also covers business ideas, business models, business plans, marketing, market assessment, competition, product development, and customer development.

The discipline also develops students' understanding of leadership and teamwork. Students examine the essence of leadership, power and influence, leadership styles, decision-making, motivation, communication, and the qualities of an effective business leader.

By completing the course, students gain a broader understanding of how creativity, innovation, leadership, and entrepreneurship interact in modern professional and business environments. The course prepares them to generate and evaluate ideas, develop innovative projects, create business models, work effectively in teams, communicate their vision, and take responsible decisions in uncertain and dynamic conditions.

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EMINReM Newsletter

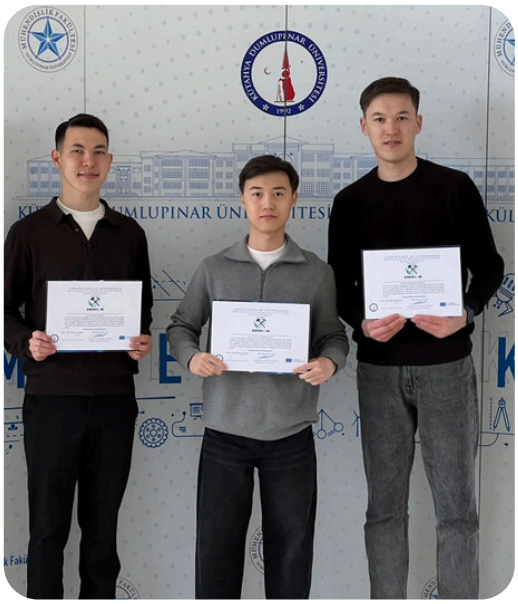
12 Edition

Academic Mobility of Students from Ukraine, Kazakhstan and Uzbekistan

Within the framework of the Erasmus+ EMINReM project, students from partner higher education institutions in Ukraine, Kazakhstan and Uzbekistan took part in academic mobility and internship programmes at European universities. These opportunities allowed students to gain international academic experience, strengthen their professional competencies, and apply theoretical knowledge in practical and research-oriented environments.

Students from Zhytomyr Polytechnic State University and Donetsk National Technical University completed their internships at the University of Jaén and the Polytechnic School of Linares in Spain. Their mobility activities focused on sustainable mining practices, innovative natural resource management, environmental protection, mine and groundwater assessment, and research on eco-friendly mining technologies. During the internships, students worked with academic materials, laboratory facilities, scientific literature, and research methods relevant to their fields of study.

Students from Dnipro University of Technology and Tashkent State Technical University named after Islam Karimov carried out their internships at the Freiberg Mining Academy in Germany. Their training was connected with mining, surface mining, metallurgy, mineral processing engineering, and the analysis of materials and technologies used in the mining sector. The internships provided students with access to academic resources, university libraries, research materials, and professional consultations that supported their thesis work and further professional development.



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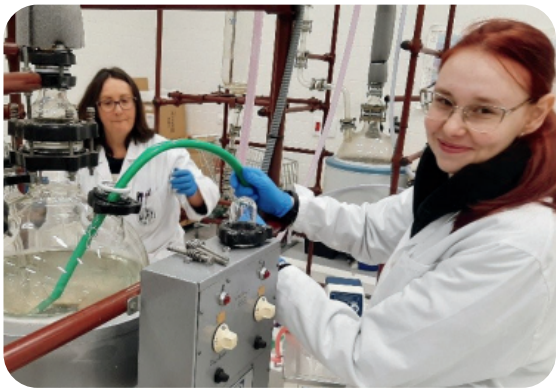
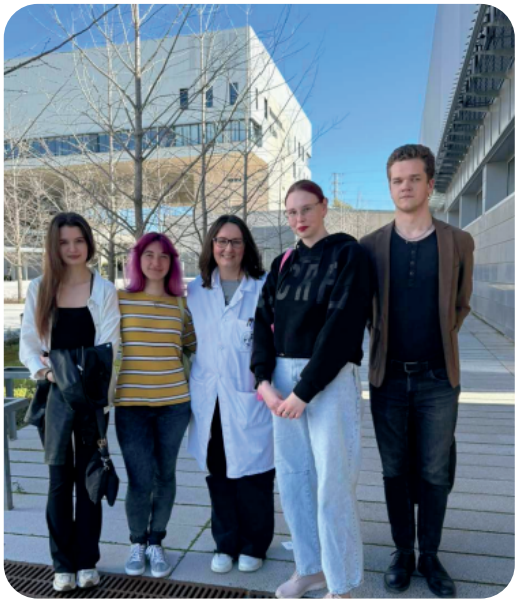
12 Edition

Resources Modelling and Evaluation: Course Overview

Students from Satbayev University, Abylkas Saginov Karaganda Technical University and Navoi State University of Mining and Technologies completed their internships at Dumlupinar University in Türkiye. During their mobility, they attended classes, visited laboratory facilities, studied mineral processing and separation methods, worked with specialised software such as Micromine and Surfer, and gained practical experience in mining engineering, technical design, modelling, visualisation, and risk analysis.

Overall, the academic mobility of students from Ukraine, Kazakhstan and Uzbekistan strengthened cooperation between EMINReM partner universities and contributed to the internationalisation of education. The internships helped students expand their academic knowledge, improve practical and research skills, develop intercultural communication, and prepare for future professional challenges in eco-mining, mineral processing, environmental protection, and innovative natural resources management.





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EMINReM International project has completed three years of work on modernizing the mining education with Satbayev University conference

The final coordination meeting and the final conference of the international Erasmus+ Master Programme in Eco-Mining and Innovative Natural Resources Management project have started at Satbayev University. Over the course of three days, representatives of universities and industrial partners from Kazakhstan, Ukraine, Uzbekistan, Germany, Spain and Turkey will summarise the results of three years of work to modernise master's education in mining, ecology and natural resource management.

Vasyl Mamrai, project coordinator and head of the International Relations Department at Zhytomyr Polytechnic State University, said that the project aimed to modernise master's degree programs in mining, taking into account current requirements for digitalisation and management competencies, thereby significantly expanding the content of classical engineering education.

During project implementation, partner universities have upgraded their master's degree programs, developed new teaching materials, implemented digital solutions, and furnished laboratories with modern equipment. University professors have been trained abroad, coordinating their approach to learning with their European colleagues. As a result, the programs were significantly expanded and brought to the level of comprehensive education, including not only mining, but also management, IT and ecology.

The participating universities are summarising the project results at an international conference dedicated to current trends in mining, the sustainable use of natural resources, and the transformation of engineering education.

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