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*TIMREX – T-Shaped Master Programme for Innovative Mineral Resource Exploration*

*Enrolment applications to the Master Study Programme in  
Applied Geology and Geological Engineering,  
Module Exploration and Environmental Geology  
at the University of Zagreb – Faculty of Mining, Geology and  
Petroleum Engineering  
are open for the academic year 2023/24!*

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The Timrex labelled Master Programme at UniZG-RGNF is part of the new University Master Study Programme in *Applied Geology and Geological Engineering, Module Exploration and Environmental Geology*.

[Check our requirements and application procedure](#)

**TIMREX** program is **EIT RawMaterials** funded MSc **labelled double-degree** (60 ECTS) **programme** in the field of innovative mineral resources exploration based on existing four relevant master programmes led by University of Miskolc (UM), University of Zagreb – Faculty of Mining, Geology and Petroleum Engineering (UNIZG-RGNF), Luleå University of Technology (LTU) and Wrocław University of Science and Technology (WUST).



Fig 1 Eight TIMREX mobility pathways between partnering universities. UniZG-RGNF is part of **Mobility Pathways 3 and 4** for the cohort 2023/24

**Cohort 2023/24** starting at the University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering will enrol in the new university MSc programme in Applied Geology and Geological Engineering – Module Exploration and Environmental Geology, and select between preferred mobility routes (Fig 1):

**Zagreb (year 1) – Miskolc (year 2) – Mobility Pathway 3**

**Zagreb (year 1) – Wroclaw (year 2) – Mobility Pathway 4**

Application documents must be submitted by **September 22, 2023** at the latest to Assoc. Prof. Ana Maričić at [ana.maricic@rgn.unizg.hr](mailto:ana.maricic@rgn.unizg.hr).

**EIT RawMaterials** provide an **AVSA Grant** of **13,500€** per eligible student. This scholarship is expected to cover the students' participation fee (scholarship) and all students' living expenses for 2 years.

	Students' participation fee	
	EU/EEA citizen	Non-EU/EEA citizen
<b>UniZG-RGNF (Year 1)</b>	<b>1,115€</b>	<b>1,858€</b>
<b>UM or WUST (Year 2)</b>	<b>2,000€</b>	<b>4,000€</b>

The total quota for **Mobility Pathways 3 and 4** in the academic year 2023/2024 is 20 students.

The maximum number of AVSA Grants for **Mobility Pathways 3 and 4** is seven.

Eligible students without AVSA Grants are welcome to enrol as self-funded students, independently of their funding sources.

Selection of **AVSA Grant** holders will be based on a [2-step ranking procedure](#) and students will be informed of the selection results until September 29, 2023.

### Mobility Pathway 3 (Zagreb-Miskolc)

**Pathway 3 UNIZG-RGNF — UM** is primarily focused on raw materials exploration activities with advanced analytical and geophysical methods (Tables 1 and 2).

Table 1 List of courses for *Applied Geology and Geological Engineering* MSc program, *Exploration and Environmental Geology* module program with class hours, ECTS credits and objectives.

LIST OF COURSES/MODULES				
Year of study: 1				
Semester: 1				
COURSE	L	E	ECTS	OBJECTIVES
Engineering Geological Investigations	30	30	5	The objective is to adopt basic knowledge about engineering geological investigations for the purpose of design in civil engineering and mining.
Sedimentology	30	45	5	To acquire the main techniques in defining sedimentary facies, to recognize sedimentation processes, to recognize the basic features of modern and palaeo-depositional environments, to recognize and interpret characteristic sedimentary sequences, to analyse all elements present in the sedimentary environment and interpret possible depositional environment.
Petroleum Geology	30	45	5	The goal is to acquire specific knowledge and skills in the field of petroleum geology, which are intended to prepare the students, future engineers for all aspects of exploration and exploitation of oil, gas, condensate and geothermal waters as well as for professional interaction with engineers of related professions in teamwork.
Mineral Deposits Exploration	30	45	5	The objective of the course is to get acquainted with geological methods of exploring mineral deposits and their evaluation.
Exploration Geochemistry	30	15	4	Students will be introduced to the basic principles of geochemical prospecting, i.e., finding the geochemical anomaly caused by the weathering of the ore deposit. Students will be introduced to the behavior of trace elements in surface environments, sampling media (soil, water, sediment, plant rocks), chemical analysis of geological materials (AAS, ICP), statistical methods and interpretation of geochemical data. Students will develop their communication skills through oral presentation and writing reports related to project assignments.
Remote Sensing of Mineral Resources	15	15	3	Students will acquire basic knowledge from remote sensing, with an emphasis on their application in mineral exploration. To enable students to independently collect and analyse multispectral, hyperspectral and radar satellite images required for analysis at surface mineral resources. Introduce students to the automatic supervised and unsupervised classification of satellite images in the analysis of surface mineral raw materials.
GIS in Exploration of Mineral Resources	30	15	3	Master all significant options in GIS software while solving specific examples from the profession. Acquiring the knowledge needed to develop your own GIS projects. Advanced use of geoinformatics on computer and mobile platform. Visualization of GIS projects for the purpose of making cartographic contents of diploma theses.
LIST OF COURSES/MODULES				
Year of study: 1				
Semester: 2				
COURSE	L	E	ECTS	OBJECTIVES
Regional Hydrogeology	30	30	4	Hydrogeological interpretations on a regional scale and the acquisition of skills in presenting hydrogeological features and calculating groundwater reserves. The student will acquire basic knowledge about the aquifer systems of the Republic of Croatia and strategic groundwater reserves.
Seismotectonics	30	15	4	To describe the basics on seismotectonics in different geodynamic settings on Earth, in particular in Croatia, in circum Adriatic region and in the Eastern Mediterranean, and to provide students general knowledge on field and lab methods used in evaluation of seismicity and seismic hazard, assessment of recent tectonic movements on local and regional scale, active stress regimes in the Earth's crust, and in identification and characterization of active, seismogenic faults and seismogenic sources.
Industrial Mineral Deposits and Applications	30	30	5	The objective of the course is to learn about the physicochemical and geological conditions of formation of deposits of the main industrial minerals and their application in industry.

Analyses of Mineral Paragenesis	15	30	3	The goal of the course is to train the students in microscopic analysis of different generations of mineral parageneses in magmatic and metamorphic rocks and their interpretation in the light of petrogenesis and later evolution of these rocks in the certain geotectonic environment.
Analytical Methods in Ore Deposits	30	30	5	The aim of this course is to review the most important analytical methods and applications in the mineral deposits investigation in order to determine mineralogical, geochemical and isotopic composition and reconstruction of genetic processes. The course covers: microscopy in transmitted and reflected light, electron microscopy and electron microprobe, microthermometry of fluid inclusions, ion chromatography, vitrinite reflection, crystallinity of chlorite, illite and graphite, atomic absorption and emission spectroscopy, inductively coupled plasma mass spectrometry (ICP-MS), stable and radiogenic isotopes.
Geophysical Exploration of Mineral Resources	30	0	3	Mastering the specialist geophysical methods of measurement and interpretation applied in the exploration of construction materials deposits and solid raw mineral materials.
Field and Laboratory Practicum		128	6	Students will be introduced to various field and laboratory methods used in exploration of mineral deposits. Students will be trained to recognize mineralization, visualize 3D geological structures, and reconstruct geological history. Most of the activities will be related to proper geological fieldwork: observation, personal filed book, interpretation and sampling. Furthermore, students will analyse the collected geological samples of water, soil, rocks, sediments, minerals in the laboratories. Finally, they will learn to combine and interpret obtained field and laboratory results with previous geological research and produce and present geological expert reports.

Table 2 List of courses for *Earth Science Engineering MSc* program at University of Miskolc with class hours, ECTS credits and objectives.

LIST OF COURSES/MODULES				
Year of study: 2				
Semester: 3				
COURSE	L	E	ECTS	OBJECTIVES
Engineering physics	2	1	4	This is primarily a theoretical course, giving strong background for later geophysical courses in order to understand and interpret the physical processes that are used in geophysical prospecting and exploration works.
Computer science for engineers	0	2	4	The course provides practical skills to solve technical tasks by applying numerical methods.
Data and information processing	2	1	4	The course provides both theory and practice in the understanding the basics of inversion method-based geoinformation processing and theoretical background and application of data processing tasks as principal for completion of geophysical measurements and interpretation work.
Graduate research seminar	0	2	2	To introduce the methods of information gathering and evaluation, formal and ethic requirements of scientific communication, rules for preparation of oral and poster presentations. During the course these general requirements are actualized to the field of earth science and engineering. Examples and exercises will use English publications and text materials.
Geophysical interpretation and prospecting	2	2	4	In the scope of this subject students acquire knowledge about the closing phase of geological-geophysical exploration and study the linkage and hierarchy of different geophysical methods. They learn how to determine the most probable geological model by using geophysical measurement results and other geoscientific information jointly. They study the points of view of exploration and measurement planning related to the interpretation of data acquitted.
Quality management	2	0	2	Having finished the course students will be able to define the parameters of quality and customers satisfaction in connection with the own business.
Thesis work 1 / student research			6	To complete research or development work in a topic of mineral exploration-related technique, method or approach development or justification in laboratory or at field condition.
Exploration Entrepreneurship			4	To equip students with the professional skills to increase their employability and entrepreneurship skills to meet the current market demands. The EFGeoMentoring scheme aims at improving international networking and supporting the life-long learning and CPD requirements of experienced geology professionals. In addition,

				it allows students to benefit from insider knowledge about international work perspectives in different sectors of geological profession and countries.
<b>LIST OF COURSES/MODULES</b>				
Year of study: 2				
Semester: 4				
<b>COURSE</b>	<b>L</b>	<b>E</b>	<b>ECTS</b>	<b>OBJECTIVES</b>
Safety techniques and labor safety	2	0	2	The aim of the subject for students is to learn the basics of work safety and health. Get knowledge about the skills of an EHS specialist in practice.
Thesis work (including SoC internship)			26	The overall goal of the course is that the student practices, develops and is able to apply theory and methods to solve unstructured problems within the main are of study Geoscience in the correct manner.

## Mobility pathway 4 (Zagreb-Wroclaw)

**Pathway 4 UNIZG-RGNF — WUST** is focused on mineral raw materials exploration and modelling methods used (Tables 3 and 4).

Table 3 List of courses for *Applied Geology and Geological Engineering* MSc program, *Exploration and Environmental Geology* module program with class hours, ECTS credits and objectives.

LIST OF COURSES/MODULES				
Year of study: 1				
Semester: 1				
COURSE	L	E	ECTS	OBJECTIVES
Engineering Geological Investigations	30	30	5	The objective is to adopt basic knowledge about engineering geological investigations for the purpose of design in civil engineering and mining.
Sedimentology	30	45	5	To acquire the main techniques in defining sedimentary facies, to recognize sedimentation processes, to recognize the basic features of modern and palaeo-depositional environments, to recognize and interpret characteristic sedimentary sequences, to analyse all elements present in the sedimentary environment and interpret possible depositional environment.
Petroleum Geology	30	45	5	The goal is to acquire specific knowledge and skills in the field of petroleum geology, which are intended to prepare the students, future engineers for all aspects of exploration and exploitation of oil, gas, condensate, and geothermal waters as well as for professional interaction with engineers of related professions in teamwork.
Mineral Deposits Exploration	30	45	5	The objective of the course is to get acquainted with geological methods of exploring mineral deposits and their evaluation.
Exploration Geochemistry	30	15	4	Students will be introduced to the basic principles of geochemical prospecting, i.e., finding the geochemical anomaly caused by the weathering of the ore deposit. Students will be introduced to the behavior of trace elements in surface environments, sampling media (soil, water, sediment, plant rocks), chemical analysis of geological materials (AAS, ICP), statistical methods and interpretation of geochemical data. Students will develop their communication skills through oral presentation and writing reports related to project assignments.
Remote Sensing of Mineral Resources	15	15	3	Students will acquire basic knowledge from remote sensing, with an emphasis on their application in mineral exploration. To enable students to independently collect and analyse multispectral, hyperspectral and radar satellite images required for analysis at surface mineral resources. Introduce students to the automatic supervised and unsupervised classification of satellite images in the analysis of surface mineral raw materials.
GIS in Exploration of Mineral Resources	30	15	3	Master all significant options in GIS software while solving specific examples from the profession. Acquiring the knowledge needed to develop your own GIS projects. Advanced use of geoinformatics on computer and mobile platform. Visualization of GIS projects for the purpose of making cartographic contents of diploma theses.
LIST OF COURSES/MODULES				
Year of study: 1				
Semester: 2				
COURSE	L	E	ECTS	OBJECTIVES
Regional Hydrogeology	30	30	4	Hydrogeological interpretations on a regional scale and the acquisition of skills in presenting hydrogeological features and calculating groundwater reserves. The student will acquire basic knowledge about the aquifer systems of the Republic of Croatia and strategic groundwater reserves.
Seismotectonics	30	15	4	To describe the basics on seismotectonics in different geodynamic settings on Earth, in particular in Croatia, in circum Adriatic region and in the Eastern Mediterranean, and to provide students general knowledge on field and lab methods used in evaluation of seismicity and seismic hazard, assessment of recent tectonic movements on local and regional scale, active stress regimes in the Earth's crust, and in identification and characterization of active, seismogenic faults and seismogenic sources.

Industrial Mineral Deposits and Applications	30	30	5	The objective of the course is to learn about the physicochemical and geological conditions of formation of deposits of the main industrial minerals and their application in industry.
Analyses of Mineral Paragenesis	15	30	3	The goal of the course is to train the students in microscopic analysis of different generations of mineral parageneses in magmatic and metamorphic rocks and their interpretation in the light of petrogenesis and later evolution of these rocks in the certain geotectonic environment.
Analytical Methods in Ore Deposits	30	30	5	The aim of this course is to review the most important analytical methods and applications in the mineral deposits investigation in order to determine mineralogical, geochemical and isotopic composition and reconstruction of genetic processes. The course covers: microscopy in transmitted and reflected light, electron microscopy and electron microprobe, microthermometry of fluid inclusions, ion chromatography, vitrinite reflection, crystallinity of chlorite, illite and graphite, atomic absorption and emission spectroscopy, inductively coupled plasma mass spectrometry (ICP-MS), stable and radiogenic isotopes.
Geophysical Exploration of Mineral Resources	30	0	3	Mastering the specialist geophysical methods of measurement and interpretation applied in the exploration of construction materials deposits and solid raw mineral materials.
Field and Laboratory Practicum		128	6	Students will be introduced to various field and laboratory methods used in exploration of mineral deposits. Students will be trained to recognize mineralization, visualize 3D geological structures, and reconstruct geological history. Most of the activities will be related to proper geological fieldwork: observation, personal filed book, interpretation and sampling. Furthermore, students will analyse the collected geological samples of water, soil, rocks, sediments, minerals in the laboratories. Finally, they will learn to combine and interpret obtained field and laboratory results with previous geological research and produce and present geological expert reports.

Table 4 List of courses for *Mining and Geology MSc, Mineral Resources Exploration specialization* program at Wroclaw University of Science and Technology with class hours, ECTS credits and objectives.

LIST OF COURSES/MODULES				
Year of study: 2				
Semester: 3				
COURSE	L	E	ECTS	OBJECTIVES
Computer aided geological modelling and geostatistics	1	3	5	Course is introduction to the principles of digital modelling of typical geological structures, methods of deposit parameters estimation and resources evaluation. During course students will develop basic skills in computer modelling of 3-D objects.
Engineering geophysics	1	1	3	Students will be introduced with the nature and subject matter of descriptive and applied geophysics studies and also the basic physical properties of rocks, phenomena and physical fields occurring in the geosphere
Project management, appraisal and risk evaluation	1	2	5	The course combines two groups of topics: basics of mineral economics and financial management and introduction to project management.
Principles and Application of InSAR and GIS in mining	2	2	5	The course combines two groups of topics: introduction to satellite radar interferometry and introduction to map algebra and spatial statistics for determination and modelling of mining related ground movements.
Digital mine	1	1	2	Providing students with knowledge about embedded systems, their construction, selection of components, designing, programming and their exploitation and familiarizing with the advances of technology & methods of future mining operations.
Environmental management	2	0	3	To get students acquainted with systems of environmental management both in Poland and other EU countries.
Occupational Health and Safety	1	0	2	To introduce the principles of occupational risk assessment in accordance with relevant standards. To present the principles of occupational risk assessment and the determination of admissibility with the use of STER software and the RISC SCORE method.
Operations Research	1	0	3	Acquiring basic knowledge, taking into consideration its application aspects concerning mathematical decision models used in management.



Foreign language	1		2	Mastering the linguistic skills necessary for writing academic texts in foreign language.
<b>LIST OF COURSES/MODULES</b>				
Year of study: 2				
Semester: 4				
<b>COURSE</b>	<b>L</b>	<b>E</b>	<b>ECTS</b>	<b>OBJECTIVES</b>
Diploma seminar			2	Synthesis of knowledge from the completed studies and practical experience.
Exploration entrepreneurship			4	To equip students with the professional skills to increase their employability and entrepreneurship skills to meet the current market demands. The EFGeoMentoring scheme aims at improving international networking and supporting the life-long learning and CPD requirements of experienced geology professionals. In addition, it allows students to benefit from insider knowledge about international work perspectives in different sectors of geological profession and countries.
Foreign language 2			1	Mastering the linguistic skills necessary for writing academic texts in foreign language.
Thesis work (including student research activity and SoC internship)			23	The overall goal of the course is that the student practices, develops and is able to apply theory and methods to solve unstructured problems within the main areas of Geoscience study.

**In addition, all students will have cross-sectional activities.**

**15 ECTS of integrated curricula activities for all TIMREX students enrolled in Miskolc, Zagreb and Wroclaw (supported by the TIMREX project)**

Summer field camp in North Sweden (3 ECTS); Internship (4 weeks); EFG course (4 ECTS); SOC Internship (2 ECTS); Thesis research work (6 ECTS)

### **Summer field camp (3 ECTS)**

Summer field camp at N-Sweden, including the short course LTU-5 Applied Field Exploration in the Skellefte VMS district – 3 ECTS (Applied Field Exploration, Course, – Luleå University of Technology (ltu.se)). The Summer field camp will integrate theoretical knowledge and practical skills with field-based practice in structural and regional geology, geophysical and geochemical exploration methods and complex data analysis and interpretation.

### **Internship (4 weeks)**

Students of the TIMREX programme shall do a 4-week internship between the two academic years and encouraged to join the RIS Internship network (<https://www.ris-internship.eu/apply-now>). The RIS Internship network offers internship positions for MSc students from the RIS region and connects students with industrial organizations. This opportunity will provide another tool for the students to acquire field experience and be involved in industry-related thesis topics.

### **Exploration entrepreneurship course (4 ECTS)**

Exploration entrepreneurship course taught by the EFG as a horizontal course for all students - 4 ECTS. The course is based on the EFG mentoring programme and will provide direct experiences about practice of an exploration private expert or team worker of a junior company, under the umbrella of the EFG's existing mentoring programme. The course has a key importance in the TIMREX MSc programme giving specific competences for the students to become after graduation specialists with EurGeol title and be able to provide mineral exploration services as freelanced experts.



### Social and Civic internship (2 ECTS)

Social and Civic internship as a 2 ECTS part of the thesis work preparation. SOC internship shall be completed under the supervision of the industrial or research partner and mentored by the LPRC and EFG fellows. The SOC internship will depend on the specialty of the thesis topic, associating it with sustainability and social responsibility goals. These competences will be important during their professional career to solve social issues related to social license to operate, manage complex organizational tasks which appear very often in mineral exploration field campaigns. Results of the SOC internship will be summarized in the few-pages EIT chapter of the thesis work. The SOC internship contributes to better value judgements, better understanding of sustainability issues, and behaving accordingly, as well as to leadership and intercultural skills.

### Thesis research work (6 ECTS)

Student research work under supervision of industrial and research partners, first of all from the TIMREX consortium but also involving other exploration and mining companies and research institutes with relevant competences. The student research work will be connected to development of innovative mineral prospecting or exploration methods and solutions and shall be connected to the thesis work. It has 6 ECTS minimum, as part of the thesis work or as an individual course depending on the mobility track. The aim of the course is to develop the innovation and creativity competences of the students by giving them the opportunity to participate in ongoing research and development which focus on mineral exploration method or technique development. Examples are sensor technics development and robotisation – Unexmin Georobotics, INESC TEC, Geophysical inversion – Geogold Kárpátia.

#### Networking and Alumni

LinkedIn TIMREX network; TIMREX Alumni (EIT RawMaterials alumni), EFG (European Federation of Geologists) membership

#### LinkedIn TIMREX network

Students will be asked to create (or to keep) a LinkedIn profile and to join the TIMREX LinkedIn profile as well. The TIMREX LinkedIn profile will be one of the main communication channels to communicate with the alumni, distribute job offers or calls from partners.

LinkedIn profiles of the alumni will be regularly checked by the TIMREX Academic Affairs Manager annually to follow up the job positions filled by the graduates. This database is used internally within the TIMREX consortium for feedback about the career track of the graduates.

#### EFG membership

Students will be encouraged to join the European Federation of Geologists (EFG). As long as mentors from the EFG will lead a specific course in the TIMREX programme – Exploration entrepreneurship, students will be in direct contact with this professional association. Therefore, graduates are expected to join the EFG which gives another option to keep contact and track the career.

#### TIMREX Alumni (EIT RawMaterials Alumni)

EIT RawMaterials Academy has its alumni network (<https://alumni.eitrawmaterials.eu/page/about-eit-rawmaterials-alumni>). EIT RawMaterials Alumni was founded in 2018. This network connects the former

students with industry, academia and innovators across the raw materials sector and promotes the EIT RawMaterials events and services as well. The platform offers industry advisors and career development opportunities as well. TIMREX graduates will be encouraged to join the EIT RM alumni network.

All TIMREX students and graduates are eligible for membership in EIT RawMaterials Alumni, the alumni association of EIT RawMaterials.

EIT RawMaterials Alumni offers:

- Access to five Industry Advisors, who are available to answer questions any time;
- Subsidised places in EIT RawMaterials-funded events;
- the opportunity to socialize and network with the hosts and other alumni members.
- The opportunity to attend the RawMaterials Summit: Flagship event of EIT RawMaterials taking place annually and bringing together 500+ stakeholders from industry, academia, research and policy.
- EIT Alumni CONNECT: Annual event with alumni from other KICs, organized by EIT HQ in Budapest.
- Expert fora: Topical and thematic events organized several times per year, which bring together industry, academia, research and policy stakeholders to discuss strategically relevant topics in the raw materials sector.
- Opportunity to connect with one of the Alumni's local hubs through local representatives.
- Access to EIT RawMaterials Alumni's exclusive online networking platform.
- Dedicated courses and training events for EIT RawMaterials Alumni membership.

*For more info contact:*

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