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# Master in Resources Engineering

EIT-LABELLED


MASTER'S PROGRAMME

With the support of the  
Erasmus+ Programme  
of the European Union





# Introduction



Our modern lifestyle relies on raw materials. From the iron and steel of our railway infrastructure to the gold and silver in the circuitry of smartphones: raw materials are everywhere. Even the transition to a climate neutral future requires cobalt for electric vehicles, lithium for rechargeable batteries, silicon for photovoltaics and solar panels, and rare earth elements for wind turbines that generate renewable energy.

As the world grows smaller and more hyper-connected, the impact of society on the Earth has never been more visible. It is now clear that we need to shift to a circular economy in order to responsibly use the Earth's finite resources. But what can just one individual do to help? More than you think! Real change requires courage, innovative thinking, and collective action – the same skill set that EIT RawMaterials Academy looks for in prospective students. Are you ready to mine your raw talent, help shape a more circular, green economy, and create sustainable solutions for tomorrow?







# What do we offer students?

EIT RawMaterials Academy offers students a unique opportunity to learn in a dynamic environment, focusing on real-life challenges. Awarded by the EIT (European Institute of Innovation and Technology), a body of the European Union, the EIT Label is a certificate of quality that is granted only to excellent educational programmes at the master's and doctoral level.

As a student of an EIT-Labelled programme from EIT RawMaterials Academy, you'll be part of the largest European raw materials network with more than 120 core and associate partners and 180 project partners, including higher education professionals, researchers, and industry experts from over 20 European countries. As an EIT Label student, you will be welcomed into this network and will champion and contribute to the EIT RawMaterials goals of finding new, innovative solutions to secure the sustainable supply of raw materials across the value chain: from explo-

ration, mining and extraction, to mineral processing, recycling and the movement towards a circular economy. EIT RawMaterials aims to equip a new generation of innovators in Europe with the necessary entrepreneurial mind-set for designing and delivering materials solutions. You'll also get the chance to collaborate internationally and develop sustainable solutions to pressing economic, environmental and societal challenges. And long after you graduate, you can stay connected via EIT RawMaterials Alumni.



JOIN AN EIT-LABELLED PROGRAMME AND BECOME A  
GLOBAL GAME-CHANGER, ARMED WITH THE KNOWLEDGE,  
SKILLS AND EXPERIENCE EMPLOYERS SEEK.





# What to expect?

→ Thesis internship placements at leading European companies

→ Membership of the EIT RawMaterials Alumni community

→ 'Learning by doing' with challenge-based courses that focus on real-life problems

→ Study tours and visits to innovative companies and industrial sites

→ Exciting new ways of learning: online courses, virtual and augmented reality and MOOCs

→ Courses designed to nurture start-up ideas with accelerators and incubators

→ Course modules dedicated to entrepreneurship and innovation skills

→ EIT RawMaterials Innovation support: business plan competitions, innovation bootcamps, seed funding

→ Expertise in a raw materials discipline – a comprehensive understanding of the entire raw materials value chain

→ EIT RawMaterials summer schools and interdisciplinary courses

→ European mobility – study in at least two European countries





# Master in Resources Engineering

(Innovative Education in Geometallurgy and Circular Economy)  
Awarded the EIT Label in 2016

## THE CHALLENGE

The EMerald master's programme was created to answer the urgent need expressed by the European Union to create a resource-efficient Europe. As the EU recognised the importance of mineral and metal resources in our modern economy, it also realised that the raw materials industries were facing a critical skills shortage.

The EMerald master's programme aims to train a new generation of engineers with an entrepreneurial mind-set and a global vision of the value chain, putting the extraction of mineral and metal resources on a circle that continues by collecting end-of-life products and recovering valuable materials out of urban mines (circular economy). Therefore, the master's course will focus on two aspects:

- Bridging the gap between geological exploration and mineral processing by offering innovative education in geometallurgy
- Helping to close the loop in a resource-efficient way by forming professionals who know the processing challenges and the need to meet targets in terms of recyclability



<b>Double Diplom</b>	<p>The consortium will deliver a triple diploma (one from each university where the student attended lectures) and a Diploma Supplement from the coordinating university:</p> <ul style="list-style-type: none"> <li>– Ingénieur Civil des Mines et Géologue delivered by University of Liège (ULiège)</li> <li>– Master Sciences de la Terre et des Planètes Environnement delivered by University of Lorraine (UL)</li> <li>– Master of Science – Major: Geosciences delivered by Luleå University of Technology (LTU)</li> <li>– Master in Mechanical and Process Engineering delivered by Technische Universität Bergakademie Freiberg (TUBAF)</li> <li>– EIT Label Certificate</li> </ul>
<b>Credits</b>	120 ECTS, 24 months
<b>Language of Instruction</b>	English
<b>Starts in</b>	September
<b>Requirement</b>	<p>Eligible candidates must have a bachelor's degree in Engineering with basic knowledge in Geology or a bachelor's degree in Minerals Engineering, Mining Engineering, Chemical Engineering, Geological Engineering, Metallurgical Engineering or a master's degree in Geology. At least 22.5 ECTS in Mathematics at university level are required. Candidates must also demonstrate proficiency in the English language.</p>
<b>Tuition fees</b>	<p>EU students 2021: €4,500/year  Non-EU students 2021: €9,000/year  For up-to-date fee information, visit <a href="http://www.em-georesources.eu">www.em-georesources.eu</a></p>
<b>Application Period</b>	<p>12 November 2020 – 14 February 2021 for Erasmus Mundus scholarships  1 March 2021 – 30 April 2021 for non-EU self-funded students  1 March 2021 – 30 June 2021 for EU self-funded students</p>
<b>Scholarships</b>	<p>For students beginning in September 2021, EIT Label scholarships from EIT RawMaterials of €13,500 per eligible student are available. For information on how EIT Label scholarships will be awarded and who is eligible, please contact the coordinating university directly: <a href="mailto:emerald@uliege.be">emerald@uliege.be</a>  A number of Erasmus Mundus Joint master's degree scholarships are available, covering full tuition fees and living expenses – visit <a href="http://www.em-georesources.eu">www.em-georesources.eu</a> for details.</p>

## PARTICIPATING UNIVERSITIES

### University of Liège

Belgium

### University of Lorraine, ENSG Nancy

France

### Luleå Institute of Technology

Sweden

### TU Bergakademie Freiberg

Germany

## FOR MORE INFORMATION

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# Master in Resources Engineering

(Innovative Education in Geometallurgy and Circular Economy)  
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## INNOVATION AND ENTREPRENEURSHIP TRAINING

As an EIT-Labelled programme, EMerald aims to nurture interdisciplinary engineers who possess not only a deep knowledge of georesources, but also a holistic view of the entire raw materials value chain and an entrepreneurial, creative mind-set.

- Provides you with the opportunity to gain insight into the industrial world and to raise your awareness and understanding of the whole raw materials value chain through professional seminars and technical visits
- Offers many courses targeted to facilitate the acquisition of entrepreneurial skills. You will learn how to work in teams and communicate your results to a broad public. In certain courses you will conduct real case studies from data integration to the estimation of resources, including economic aspects
- As an EIT-Labelled programme, EMerald aims to nurture interdisciplinary engineers who possess not only a deep knowledge of georesources, but also a holistic view of the entire raw materials value chain and an entrepreneurial, creative mind-set.
- Receives support from leading companies who have an advisory role to the programme through a Strategic Advisory Board (SAB), which ensures that the courses of the programme meet their professional expectations

Between the first and the second year, the EMerald master's organises a summer business school, a three week intensive course which will take place in Freiberg in August.

As an EMerald student, you will get the opportunity to take solid management courses in finance, marketing, business modelling and operations management, providing you with key insights into how engineering solutions can be applied to, and taken up by, society and industry.

## PROFESSIONAL PROFILES AFTER GRADUATION

The knowledge and skills EMerald graduates gain are highly valued in the industry and beyond. Not only are EMerald graduates qualified to work in the fields of mining, building materials (cement, aggregates), non-ferrous metals production and circular economy of metals and mineral chemistry; possible career paths also include working for:

- Geological surveys
- Junior exploration companies
- Investment banks (resources sector)
- Venture capital (resources sector)
- EU Commission (raw materials and industry)
- National/regional governments (mining laws, implementing circular economy, mineral industry)
- EMerald also prepares you for further study (PhD) in mineral processing, geometallurgy, resources/reserves estimation, process development, mineral industry, etc.



**ARE YOU A STUDENT WHO IS:**

- Interested in sparking innovation in the raw materials sector?
- Keen to become entrepreneurial and start your own company?
- Interested in bridging the gap between geology and metallurgy?
- Curious to acquire understanding of the whole raw materials value chain?
- Motivated to expand your professional network by studying with at least three European universities?



# Programme Structure

EMerald is organised into four semesters and accounts for 120 ECTS or 30 ECTS per semester.

The first year of the programme aims to harmonise students' knowledge and help them find the right balance between resource characterisation and modelling, and processing and management techniques (multidisciplinarity). The thematic courses offered by the two universities (ULiège and UL) are complemented by a strong programme to develop transversal skills. Industry experts and invited scholars bring in key contributions on corporate social responsibility, economics, life cycle analysis and other essential aspects of modern sustainable engineering operations. All courses offer a blend of theoretical lectures and practical work in the labs. Students often work in groups on a real

case study, discovering possible processing routes for complex ores and waste materials. The third semester offers students the option to specialise more upstream at LTU (primary resources) or downstream at TUBAF (secondary resources). The final semester can be spent in any of the aforementioned institutions depending on the thesis specialisation. Regardless of the location, the master thesis will be completed in close collaboration with an industrial partner or a research centre that will also host the students for an internship. The full catalogue of courses is available on the EMerald website: [www.em-georesources.eu](http://www.em-georesources.eu)



The EMerald master's programme has given me an engineering perspective of the whole raw materials value chain. Being an EIT-Labelled programme, I've had the opportunity to be part of several EIT Raw-Materials-organised events which present extensive opportunities for networking and professional development.

— ALI, PAKISTAN



## YEAR 1

HARMONISATION, TEAM BUILDING, EXPERIENCE EUROPE

### SEMESTER 1 (30 ECTS)

University of Liège

#### Select courses for 30 ECTS between:

- Process Mineralogy (5ECTS)
- Solid Waste and By-Products Processing (5ECTS)
- Geostatistics (5ECTS)
- Seminars on Economical and Societal Issues
- Mining and Recycling (5ECTS)
- Mineral Resources (5ECTS)
- Mineral Processing (5ECTS)
- Numerical Analysis (5ECTS)
- Exploitation of Mineral Deposits (5ECTS)

### SEMESTER 2 (30 ECTS)

University of Lorraine

- Advanced Characterisation of Mineral/Water interface (5ECTS)
- Case Study of Ore Processing (5ECTS)
- Resources Modelling and Evaluation (5ECTS)
- Management of Resources ( 5ECTS)
- Exploitation of Mineral Raw Materials and Environmental Impact of Mining (2ECTS)
- Advanced Mineral Processing (8ECTS)



SUMMER BUSINESS SCHOOL



## YEAR 2

CIRCULAR ECONOMY, SPECIALISATION IN PRIMARY OR SECONDARY RESOURCES

### SEMESTER 3 (30 ECTS)

Luleå University of Technology  
Primary Resources

- Mining Geology (7.5 ECTS)
- Mineral Processing II ( 7.5 ECTS)
- Geometallurgy (7.5 ECTS)

#### Elective courses:

- Senior Design Project in Mineral Processing (7.5 ECTS)
- Simulation of Mineral Processing (7.5 ECTS)

### SEMESTER 3 (30 ECTS)

TU Bergakademie Freiberg  
Secondary Resources

- Project- Process Design Mineral Processing/ Recycling (8ECTS)
- Practice of Secondary Raw Materials (4 ECTS)
- Thermodynamics and Heat Transfer (4 ECTS)
- Selective Separation of Strategic Elements (5 ECTS)
- Resource Management (6ECTS)

#### Elective courses:

- Mineral Liberation Analysis of Mineral Resources (3ECTS)
- Simulation of Sustainable Metallurgical Process (6ECTS)

### SEMESTER 4 (30 ECTS)

University of Liège

### SEMESTER 4 (30 ECTS)

University of Lorraine

### SEMESTER 4 (30 ECTS)

Lulea University of Technology

### SEMESTER 4 (30 ECTS)

TU Bergakademie Freiberg

Master thesis



# Exclusive activities and support for EIT-Labelled students

Students on EIT-Labelled master's programmes within the EIT RawMaterials Academy receive a range of additional opportunities to boost their innovation and entrepreneurship skills, grow their network in the raw materials sector and gain the experience they need to thrive.

These exclusive events bring together EIT-Labelled students from across the Master School, and form the basis of your shared learning experiences, making you a full member of the EIT RawMaterials community.

## SEMESTER 1

- **Label Induction Days.**  
Meet the EIT RawMaterials Academy and learn how to get involved in our community and the many opportunities on offer. Sign up for EIT RawMaterials Alumni and start growing your network.
- Vote for your representative on the Label Student Board, or stand for election!

## SEMESTER 2

- **Label Start-Up! Days.**  
Get together with 100 Label students to meet and learn from five EIT RawMaterials supported start-ups. Hear about the experience of setting up a company in the raw materials sector, and network with entrepreneurs.
- All costs covered by EIT RawMaterials.





## SEMESTER 3

→ **The RACE.**

The Raw and Circular Economy Expedition is a challenge-based summer school for 70 students from around the world, taking place over two weeks in four different European countries. Find out more at [race.eitrawmaterials.eu](https://race.eitrawmaterials.eu).

- All costs covered by EIT RawMaterials for Labelled students selected for participation.

## SEMESTER 4

→ **Label-Launch!**

Celebrate completing your EIT-Labelled Master's programme during EIT RawMaterials' major event – the RM Summit. Take part in matchmaking events with EIT RawMaterials industry partners and start-ups, and make new connections with raw materials professionals.



# Do you have a raw materials business idea?

EIT RawMaterials offers a range of support for individuals and companies with innovative business ideas, including:

## Pre-Jumpstarter Workshop

- This exclusive event for students on the EIT RawMaterials Academy Labelled master's programmes offers support to develop your thinking around a start-up idea and, in particular, to prepare you to apply to the EIT Jumpstarter.

## EIT Jumpstarter

- One of Europe's top pre-accelerator programmes, to help you develop your business idea and understand what's needed to create a successful start-up.

## Booster call

- Financial and network access support for start-ups and SMEs in the raw materials sector.

## EIT RawMaterials Accelerator

- A three-stage accelerator programme to help start-ups with a developed product to bring their solution to the market.



# EIT RawMaterials Alumni

From the moment you join an EIT-Labelled master's programme in the EIT RawMaterials Academy, you are eligible to join EIT RawMaterials Alumni. This organisation provides a great opportunity to network with past and present participants in the many and varied EIT RawMaterials activities, such as business idea competitions, start-ups, professional development courses and Master's and PhD programmes.

It is run by and for its members, who can benefit from events, career development and educational activities and much more, forming a hub for a diverse range of raw materials students, academics and professionals. Furthermore, the EIT RawMaterials Alumni provides you with a connection to the wider EIT Alumni community and alumni events around Europe.





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the European Union



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With the support of the Erasmus+ Programme of the European Union



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