SYLLABUS
STUDY YEAR 2023/2024

Arctic Mineral Resources

Enrollment semester Autumn 2022

DATE
2021-10-14

REFERENCE NO.
LTU-3374-2021

DECISION MAKER
Dean of the Faculty of Science and Technology

Luleå University of Technology 971 87 Luleå, Sweden
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LULEÅ TEKNISKA UNIVERSITET

Programme content and structure

The programme comprises 120 ECTS mandatory to all students, incl specialization courses and master thesis.

The programme is given in collaboration with Technical University of Denmark (DTU, Denmark) and University of Oulu (UO, Finland). The programme is structured into two study tracks:

Mineral Resource Management (given at DTU and LTU) focuses on mineral production processes and infrastructure in the Arctic environment. The programme comprises technical courses, courses on mining and environmental legislation, incl permitting procedures, mineral economics and logistics and infrastructure.

Mineral Entrepreneurship (given at UO and LTU) focuses on entrepreneurship for mine project development in the Arctic regions. The programme comprises technical courses, courses on economical and environmental aspects, mining business administration and mineral resource evaluation

The student mobility scheme goes through the following scheme: The first term for both tracks is given by Luleå University of Technology. For the second term, the students move to Greenland (Arctic semester given by DTU, Mineral Resource Management) or Oulu (Nordic entrepreneur school at UO, Mineral Entrepreneurship), respectively. The third term offers the choice between the two universities in each track. The fourth term is assigned to the master thesis and is also shared and co-supervised by the two universities in each track.

For admission to master thesis, the specified prerequisites of the syllabus must be met. Specific information about the application and admission process for master thesis is secured by the course giving institution.

Credits

120 credits

Degree

- Degree of Master of Science (120 credits) - Major; Geosciences

Specialisations

Specialisation

- Mineral Entrepreneurship
- Mineral Resource Management

Entry requirements

A Bachelor's degree with a minimum of 180 ECTS with at least 60 ECTS in Physics, Chemistry, Geology or Arctic Technology, Mining/Civil or Minerals Engineering or other similar engineering fields. At least 15 ECTS in Mathematics at university level is required.

Good knowledge in English, equivalent to English 6

Selection

The selection procedure is based on academic qualifications, quality and quantity aspects.

Selection group

Academic: 100%

Compulsory courses

Introduction (LTU) 30 credits

Course code	Course	Cr	Level	Comment
L7026K	Sampling and Evaluation of Environmental Data	7.5	Master's level	
M7007K	Process mineralogy	7.5	Master's level	
M7010K	Introduction to the Mining Value Chain	7.5	Master's level	
O7024K	Geology of the Arctic	7.5	Master's level	

Specialisation: Mineral Entrepreneurship

Entrepreneur school (UO) 30 credits

Course code	Course	Cr	Level	Comment
	Introduction to Business Development	5		
	Stakeholder engagement and SLO	10		
	Entrepreneuring for Sustainability	5		
	Mine geology	5		
	Mining project feasibility study	5		

Deepening metallurgy (UO)

Course code	Course	Cr	Level	Comment
	Mining, environment and society	5		Selectable
	Financial and project valuation of mining	5		Selectable
	Chemistry of hydrometallurgical processes	5		Selectable
	Recycling and treatment of processing rejects	5		Selectable
	Quality requirements of concentrates	5		Selectable
	Thermodynamic and process modelling in metallurgy and mineral processing	5		Selectable

Or

Deepening mineral processing (LTU) - mandatory

Course code	Course	Cr	Level	Comment
M7003K	Mineral Processing	7.5	Master's level	Selectable
M7011K	Technical-Economic Evaluation of Mineral Industry Projects	7.5	Master's level	Selectable
M7012K	Mineral Resource Disclosure and Permitting Processes	7.5	Master's level	Selectable

Deepening mineral processing (LTU) - elective 7.5 credits

Selective space is 7.5 credits. It is mandatory to select elective courses up to the given number of credits. The given number of credits of elective courses listed must be met for degree.

Course code	Course	Cr	Level	Comment
M7005K	Senior Design Project in Mineral Processing	7.5	Master's level	Selectable
T7008B	Open Pit and Underground Mining	7.5	Master's level	Selectable

Master thesis (UO)

Course code	Course	Cr	Level	Comment
	Master thesis UO	30		Selectable

Or

Master thesis (LTU)

Course code	Course	Cr	Level	Comment
X7013K	Degree project in Arctic Mineral Resources, specialization Mineral Entrepreneurship, master	30	Master's level	Selectable

Specialisation: Mineral Resource Management

Arctic semester (DTU) 30 credits

Course code	Course	Cr	Level	Comment
	Infrastructure Constructions in the Arctic	15		
	Extreme Climate and Physical Nature	5		
	The Arctic Infrastructure and Society	5		
	Environmental Engineering in the Arctic	5		

Deepening infrastructure (DTU)

Course code	Course	Cr	Level	Comment
	Advanced rock mechanics and tunneling	5		Selectable
	Pavement mechanics	5		Selectable
	Mineral Resources	5		Selectable
	Railway Design and Maintenance	10		Selectable
	Rock Physics and Rock Mechanics	5		Selectable

Or

Deepening mineral processing (LTU) - mandatory

Course code	Course	Cr	Level	Comment
M7003K	Mineral Processing	7.5	Master's level	Selectable
M7011K	Technical-Economic Evaluation of Mineral Industry Projects	7.5	Master's level	Selectable
M7012K	Mineral Resource Disclosure and Permitting Processes	7.5	Master's level	Selectable

Deepening mineral processing (LTU) - elective 7.5 credits

Selective space is 7.5 credits. It is mandatory to select elective courses up to the given number of credits. The given number of credits of elective courses listed must be met for degree.

Course code	Course	Cr	Level	Comment
M7005K	Senior Design Project in Mineral Processing	7.5	Master's level	Selectable
T7008B	Open Pit and Underground Mining	7.5	Master's level	Selectable

Master thesis (DTU)

Course code	Course	Cr	Level	Comment
	Master thesis DTU	30		Selectable

Or

Master thesis (LTU)

Course code	Course	Cr	Level	Comment
X7014K	Degree project in Arctic Mineral Resources, specialization Mineral Resource Management, master	30	Master's level	Selectable

Study schedule

Year of study 1 Enrollment semester Autumn 2022, Is offered in 2022/2023

Study-period	Course code	Course	Cr	Comment
1	L7026K	Sampling and Evaluation of Environmental Data	7.5	
1	M7010K	Introduction to the Mining Value Chain	7.5	
2	M7007K	Process mineralogy	7.5	
2	O7024K	Geology of the Arctic	7.5	

Specialisation: Mineral Entrepreneurship

Year of study 1 Enrollment semester Autumn 2022, Is offered in 2022/2023

Study-period	Course code	Course	Cr	Comment
3-4		Mine geology	5	
3-4		Introduction to Business Development	5	
3-4		Entrepreneuring for Sustainability	5	
3-4		Mining project feasibility study	5	
3-4		Stakeholder engagement and SLO	10	

Year of study 2 Enrollment semester Autumn 2022, Is offered in 2023/2024

Study-period	Course code	Course	Cr	Comment
1	M7005K	Senior Design Project in Mineral Processing	7.5	Selectable
1	T7008B	Open Pit and Underground Mining	7.5	Selectable
1-2	M7003K	Mineral Processing	7.5	Selectable
1-2	M7012K	Mineral Resource Disclosure and Permitting Processes	7.5	Selectable
1-2		Financial and project valuation of mining	5	Selectable
1-2		Mining, environment and society	5	Selectable
1-2		Thermodynamic and process modelling in metallurgy and mineral processing	5	Selectable
1-2		Quality requirements of concentrates	5	Selectable
1-2		Chemistry of hydrometallurgical processes	5	Selectable
1-2		Recycling and treatment of processing rejects	5	Selectable
2	M7011K	Technical-Economic Evaluation of Mineral Industry Projects	7.5	Selectable
3-4		Master thesis UO	30	Selectable
3-4	X7013K	Degree project in Arctic Mineral Resources, specialization Mineral Entrepreneurship, master	30	Selectable, Entry requirements

Specialisation: Mineral Resource Management

Year of study 1 Enrollment semester Autumn 2022, Is offered in 2022/2023

Study-period	Course code	Course	Cr	Comment
3-4		The Arctic Infrastructure and Society	5	
3-4		Extreme Climate and Physical Nature	5	
3-4		Environmental Engineering in the Arctic	5	
3-4		Infrastructure Constructions in the Arctic	15	

Year of study 2 Enrollment semester Autumn 2022, Is offered in 2023/2024

Study-period	Course code	Course	Cr	Comment
1	M7005K	Senior Design Project in Mineral Processing	7.5	Selectable
1	T7008B	Open Pit and Underground Mining	7.5	Selectable
1-2	M7003K	Mineral Processing	7.5	Selectable
1-2	M7012K	Mineral Resource Disclosure and Permitting Processes	7.5	Selectable
1-2		Rock Physics and Rock Mechanics	5	Selectable
1-2		Mineral Resources	5	Selectable
1-2		Pavement mechanics	5	Selectable
1-2		Railway Design and Maintenance	10	Selectable
1-2		Advanced rock mechanics and tunneling	5	Selectable
2	M7011K	Technical-Economic Evaluation of Mineral Industry Projects	7.5	Selectable
3-4		Master thesis DTU	30	Selectable
3-4	X7014K	Degree project in Arctic Mineral Resources, specialization Mineral Resource Management, master	30	Selectable, Entry requirements