NordMin MSc course (3 ECTS)

The Business of Exploration, from the ground to the stock market

MSc students, stakeholders from industry, public authorities and NGOs are welcome to participate

14 – 18 November 2016
Orkugarður, Reykjavík, Iceland
Information
Welcome to the NordMin MSc course on Business of Exploration, from the ground to the stock market, within a Nordic context. The course is organized by Orkustofnun – National Energy Authority, in cooperation with the Faculty of Earth Sciences, University of Iceland and ÍSOR – Iceland GeoSurvey, in November 14–18, 2016, as a part of the NordMin project (www.ltu.se/nordmin) funded by the Nordic Council of Ministers for the period 2013–2016. One ambition with the NordMin project is to build a network of excellence in the Nordic countries related to sustainable mining. In this respect, we would like to create platforms and areas where stakeholders meet to discuss mining and mineral extraction from a sustainability perspective. The Nordic context means that issues such as extreme conditions (from a technical perspective and in terms of climate), environmental impact and indigenous people’s rights should be addressed together with CSR standards and the image of the extractive industry. One such platform are PhD and MSc courses organized in different Nordic countries over the lifespan of the project.

MSc course
This MSc course is a registered course at the Faculty of Earth Sciences, University of Iceland and worth 3 ECTS. The course will cover a wide range of topics related to business of exploration, or from the ground to the stock market. The course is mainly offered as lectures, but will also include student group exercises. On Wednesday, there will be a half day excursion to the Thormodsdalur gold prospect, followed by a visit to the Hellisheiði geothermal power plant. Lecturers are well known experts in their fields, coming from the Geological Survey of Finland (GTK), Finnish Association of Extractive Industries, Faculty and Institute of Earth Sciences at the University of Iceland and ÍSOR – Iceland GeoSurvey. We believe that the course will be a unique opportunity for Nordic students to meet, network and discuss business in relation to exploration. We therefore hope that we will attract students with different backgrounds and disciplines from all the Nordic countries. NordMin has created an evaluation form for the course at the NordMin website: http://www.ltu.se/research/subjects/Malmgeologi/Nordmin/PhD-courses/MSc-courses/Evaluation-of-NordMin-MSc-course-1.157534?l=en. At the end of the course the participants are asked to fill it out.

Scholarships
NordMin will offer 11 scholarships to Nordic students. Eligible for scholarships are students who, in one way or another, are studying the mining industry in their thesis work. We invite students from the full value chain of mining, including exploration, mining, mineral processing, metallurgy, environmental aspects, social and societal aspects, and political and economic aspects. A grant will be a maximum of 9,000 DKK and cover travel and accommodation costs. If you are interested in applying for a scholarship, you should send your application via email to Bryndís G. Róbertsdóttir (bgr@os.is). The deadline for an application for a scholarship is October 10. The application should contain a brief description of your MSc topic and a short summary of the costs (travel, accommodation) for which the scholarship will be used. Successful applicants will be notified on October 17.
**Registration**

Registration to the course should be made through email to Bryndís G. Röbertsdóttir (bgr@os.is). **The deadline for registration is October 31.** Maximum of 25 MSc students will be accepted on a first come-first served basis, but we will also strive for a country, gender equality and subject balance among the students.

**Practical Information**

**Travel**

Reykjavík is located approximately 50 km from the Keflavík International Airport, which has daily flights to major European airports. There are various ways to get to and from the airport. An airport bus goes directly to Reykjavík and does the trip take around 45 minutes. Also at the airport are several taxi companies and car rentals. You can find more information on the website: [www.kefairport.is/English/To-and-from-the-Airport](http://www.kefairport.is/English/To-and-from-the-Airport)

**Accommodation**

You are requested to book your own accommodation. Reykjavík offers many possibilities from first class hotels to cheaper hostels. You can find more information on the website: [http://visitreykjavik.is/where-to-stay](http://visitreykjavik.is/where-to-stay) or [www.booking.com](http://www.booking.com). In Reykjavík the average temperature is +1.1°C in November, the weather can be unstable, so take warm clothes with you, raincoat and good shoes for wet condition. There are many swimming pools, hot tubs and steam baths in Reykjavík, see: [http://visitreykjavik.is/swimming-reykjavik](http://visitreykjavik.is/swimming-reykjavik), so take your swim suit with you to Iceland.

![](image.jpg)

Orkugarður, Grensásvegur 9, Reykjavík

**Venue**

The venue for the course is Orkugarður, located on Grensásvegur 9 in Reykjavík, the capital of Iceland. Orkugarður is situated approximately 5 km southeast from the city center and can be reached by a bus. You can find more information on the website: [www.straeto.is/english/plan-your-journey/schedules-and-maps](http://www.straeto.is/english/plan-your-journey/schedules-and-maps). Orkustofnun – National Energy Authority, [www.nea.is](http://www.nea.is) and ÍSOR – Iceland GeoSurvey, [www.geothermal.is](http://www.geothermal.is), are located in the building Orkugarður.

**Important dates**

<table>
<thead>
<tr>
<th>Event</th>
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<tr>
<td>Deadline for application for MSc scholarship</td>
<td>October 10, 2016</td>
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<tr>
<td>Notification of approval/refusal of MSc scholarship</td>
<td>October 17, 2016</td>
</tr>
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<td>Deadline for registration</td>
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Course Program

Chair: Sveinborg Hlíf Gunnarsdóttir, ÍSOR – Iceland GeoSurvey

Mon Nov. 14 Prospective regions – How do we find them?
09:00 – 09:10 Welcome address and short introduction from Orkustofnun, the Faculty of Earth Sciences, University of Iceland and ÍSOR – Iceland GeoSurvey
Guðni A. Jóhannesson, Director General, Orkustofnun
09:10 – 10:35 Hot spots as an environment for mineralization
Thor Thordarson, Faculty of Earth Sciences, University of Iceland
10:35 – 12:00 Orogenic gold: the dominant gold deposit type in metamorphosed terrains
Tero Niiranen, GTK – Geological Survey of Finland
12:00 – 13:00 Lunch
13:00 – 14:20 Geothermal systems and gold exploration in Iceland
Hjalti Franszon, ÍSOR – Iceland GeoSurvey
14:20 – 15:40 VMS systems in recent environments and in metamorphosed terrains
Tuomo Törmänen, GTK – Geological Survey of Finland
15:40 – 16:30 Student group exercise (based on presentations of the day)

Map of the Mid-Atlantic Ridge on- and offshore Iceland (map modified from Hjartarson & Erlendsson 2016)
Tue Nov. 15 Prospective regions to geology of mineralized environments – Conceptual and practical models

09:00 – 10:30 Evolution of the Reykjanes ridge and possibilities for massive sulfite formation on a slow spreading ridge
Ármann Höskuldsson, Institute of Earth Sciences, Nordvol., Univ. of Iceland

10:30 – 12:00 Iron oxide-copper-gold: what it is and where occurs
Tero Niiranen, GTK – Geological Survey of Finland

12:00 – 13:00 Lunch

13:00 – 15:40 Mafic–ultramafic magmatic rock-related ores (by GTK):
  Basic theories for magmatic nickel deposit genesis (Hannu Makkonen)
  Orogenic mafic-ultramafic intrusion-related Ni deposits (Hannu Makkonen)
  Komatiite-related Ni deposits (Tapio Halkoaho)
  Layered intrusion-related PGE deposits (Tapio Halkoaho)
  Layered intrusion-related Cr and V deposits (Tuomo Törmänen)

15:40 – 16:30 Student group exercise (based on presentations of the day)

17:00 – 18:00 Ice breaker at the Faculty of Earth Sciences, University of Iceland

Wed Nov. 16 Prospective regions to geology of mineralized environments

09:00 – 10:30 Prospectivity mapping in selecting exploration targets
Vesa Nykänen, GTK – Geological Survey of Finland

10:30 – 12:00 Geochemical exploration of mineral deposits in glaciated terrains (by GTK):
Vesa Nykänen (with Hannu Makkonen, Tuomo Törmänen, Tapio Halkoaho)

12:00 – 13:00 Lunch

13:00 – 18:00 Field trip to the Thormodsdalur gold prospect (weather dependant), followed by a visit to the Hellisheiði geothermal power plant where geothermal processes, power production and environmental issues are explained.
Thu Nov. 17 Exploration methods; Planning and managing exploration
09:00 – 10:30 Pegmatite-hosted lithium deposits
Olli Sarapää, GTK – Geological Survey of Finland
10:30 – 12:00 General and detailed issues in planning and managing mineral exploration
Hannu Makkonen (with Tuomo Törmänen, Tapio Halkoaho, Olli Sarapää), GTK
12:00 – 13:00 Lunch
13:00 – 14:20 Criticality of mineral commodities: how it the issue is defined
Tuomo Törmänen (with Hannu Makkonen, Tapio Halkoaho, Tero Niiranen), GTK – Geological Survey of Finland
14:20 – 15:40 Carbonatite and peralkaline intrusion-hosted phosphate, REE, and rare metal deposits
Olli Sarapää, GTK – Geological Survey of Finland
15:40 – 16:30 Student group exercise (based on presentations of the day)

Fri Nov. 18 Financing exploration; Marketing prospective tenements
09:00 – 10:30 Mineral resource estimation according to current industrial standards
Janne Hokka, GTK – Geological Survey of Finland
10:30 – 12:00 3D modelling in regional and mineral deposit scale
Janne Hokka, GTK
12:00 – 13:00 Lunch
13:00 – 14:20 Mining law: issues significant and essential in most countries
Pekka Suomela, Finnish Association of Extractive Industries
14:20 – 15:40 Metals in geothermal fluids and metal precipitations in surface pipelines in Iceland – can these been utilized?
Vigdis Harðardóttir, ÍSOR – Iceland GeoSurvey
15:40 – 16:30 Student group exercise (based on presentations of the day)
Map of the main geological surface features of the Reykjanes high-temperature field, including ten wells (Franzson et al. 2002; map modified from Saemundsson et al. 2010)

Organizing committee

NordMin Project Management, Luleå University of Technology
Betty Christakopoulou, Project leader, betty.christakopoulou@nordmin-network.org

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