Sustainable Mines of the Future
Summer School Invitation

Sustainable rock drilling and blasting technique
Module 1 (Aalto University)
8.8-15.9.2023

Remote rock mass characterization
Module 2 (Aalto University)
18.9-21.11.2023

Mining and energy
Module 3 (RWTH Aachen)
Spring 2024 (to be announced later)

Occupational and process safety in mining
Module 4 (Montan Univ. Leoben)
2024 (to be announced later)
Remote rock mass characterization

Module 2.

The course can be completed remotely

- Understand the principles of rock mass characterization, laser scanning and photogrammetry.
- Learn how to collect own datasets for photogrammetry.
- Learn the use of photogrammetric software like RealityCapture to create 3D models.
- Learn remote mapping techniques to determine rock mass parameters.
- Learn to extract discontinuity sets and their orientation.

For Who?
Bachelor’s and Master’s students
Max number of participants: 40 students
Credits: 1 ECTS
School is free of charge!

Apply through the google forms:
https://forms.gle/Dc8MiP7SZo8tzthf8

Registrations open: 28th August, 2023
Deadline for Registration: 17th September, 2023 by 23:59

Helsinki time zone (UTC +3 EEST)

For further information contact:
hamza.javed@aalto.fi
mikael.rinne@aalto.fi

RWTH AACHEN UNIVERSITY (GERMANY)
AALTO UNIVERSITY (FINLAND)
MONTANUNIVERSITÄT LEOBEN (AUSTRIA)
TERRA project

Summer School:
Sustainable Mines of the Future

COURSE DESCRIPTION

for the Module

Remote Rock Mass Characterization
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<tr>
<th><strong>Name of the course</strong></th>
<th>Remote Rock Mass Characterization</th>
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| **Teacher in charge**  | Dr. Mateusz Janiszewski  
Dr. Lauri Uotinen |
| **Teaching period**    | September - November 2023 |
| **Level of the Course**| BSc and MSc |
| **To whom is this module beneficial** | The course is designed for bachelor and master students, engineers, researchers, and other professionals in the fields of rock mechanics, rock engineering, mining, and geology. The course is tailored to accommodate participants with varying levels of expertise, and no prior experience in photogrammetry or laser scanning is required. |
| **Learning outcomes**  | By the end of the course, participants will be able to:  
- Understand the principles and techniques of rock mass characterization, laser scanning, and photogrammetry  
- Collect photogrammetric data  
- Gain practical experience by visiting a tunnel, either in-person or by watching a recording  
- Apply data analysis methods to real-world scenarios  
- Perform hybrid-mode mapping from 3D models  
- Provide feedback on their learning experience through a lecture diary |
| **Content**            | Remote Rock Mass Characterization summer course provides an in-depth exploration of rock mass characterization techniques, including laser scanning, photogrammetry, and data analysis. The course consists of lectures and practical exercises that allow participants to apply their knowledge to real-world scenarios. Through hands-on experience, students will learn how to map from 3D models, such as a rock face and tunnel drift.  
In addition to theoretical learning, participants will be asked to maintain a lecture diary to provide feedback on their experience and track their progress throughout the course. The course will contain a 2-hour tunnel visit, where students can apply their skills in a real-world environment. Alternatively, students can opt for a remote visit to the tunnel.  
**The entire course can be completed remotely.** |
| **Implementation and assessment methods** | The module will be held as a hybrid lecture with live Q&A sessions. The exercises are structured as group work or self-study. Students are required to maintain a lecture diary, documenting their reflections and learnings from the course. This diary will also serve as a feedback mechanism for the course instructors. |
| **Course material**    | Presentations, recordings, remote mapping exercises, 3D models |
| **Prerequisites**      | Basic understanding of rock mechanics and engineering geology |
| **Workload and credits (1 cr 25-30h)** | The workload is about 30 hours, corresponding to 1 ECTS. Diploma is awarded to students who pass the course. Ask your supervisor at your home university if this module can be counted as official course completion. |
| **Lectures (contents, when)** | Lectures  
L01: Intro to rock mass characterization, **Mon 18.9 14:15-15:00**  
L02: Photogrammetry and laser scanning **Mon 25.9 9:15-11:00**  
L03: Remote rock mass characterization **Tue 7.11 13:15-15:00**  
L04: Wrap up and future trends **Mon 21.11 13:15-14:00** |
| Exercises (contents, when) | Exercises  
E01: Data acquisition, **Wed 4.10 13:15-15:00**  
E02: Tunnel visit **Tue 31.10 13:00 - 16:00**  
E03: 3D data processing, **Wed 1.11 9:15-11:00**  
E04: Remote rock mapping **Tue 14.11 13:15-15:00**  

*All times are given in Helsinki time zone (UTC+3 EEST)!*

| Assessment of learning (exam) and grading scale | The module is assessed graded as 0-5. The assessment is based on the progress reported by students in the lecture diary. |
| Registration for courses | Apply through Google form: [https://forms.gle/Dc8MiP7SZo8tzthf8](https://forms.gle/Dc8MiP7SZo8tzthf8) |
| Use of e-learning | Remote mapping on 3D models of rock mass surface, online lectures, recordings |
| Feedback management and improvement of the course | Lecture diary |

For further information contact:

- [hamza.javed@aalto.fi](mailto:hamza.javed@aalto.fi) (Module 1&2 coordinator)
- [mateusz.janiszewski@aalto.fi](mailto:mateusz.janiszewski@aalto.fi) (Course instructor)
- [lauri.uotinen@aalto.fi](mailto:lauri.uotinen@aalto.fi) (Course instructor)
- [mikael.rinne@aalto.fi](mailto:mikael.rinne@aalto.fi) (Terra Summer School management at Aalto University)