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BERGAKADEMIE FREIBERG
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MINE DISASTER AND MINE RESCUE TRAINING COURSES IN MODERN ACADEMIC MINING ENGINEERING PROGRAMS

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School of Engineering
Mining Department

Contents

Motivation

Safety still is the most important aspect when it comes to mining!

Problem:

- Increasing mechanization leads to reduction of staff members
- Tendency to increasing depths and distances of mine workings
- Aging workforce and loss of experience due to generation change
- Mining engineering graduates often lack experience

→ Fewer mining engineers are responsible for increasingly challenging mining operations

→ Increasing requirements on the knowledge of the mining engineer also concerning mine rescue, disaster management and health and safety

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- Health and safety: securing safety and preserving health

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Education of Future Mining Engineers in Mine Rescue, Disaster Management and Health and Safety

The educational programs consist of:

- **a theoretical part**
  - lectures on laws & regulations, structures & hierarchies, equipment, communication, first aid, etc.
- **a practical course**
  - training under normal and simulated “hot“ situations to improve the theoretical knowledge about the equipment, the team structures, first aid, fire training, rope rescue, etc.
- **knowledge exchange**
  - meeting of different mine rescue teams from various universities and professionals for discussions, lectures, presentations and competitions

Chapter 3

Mine Rescue and Disaster Management in the North American Mining Industry

- More than 800 mines are actively operating in the USA (2010).
- The mine rescue organization and management benefits from well-established mine regulations on the federal and state levels and specialized enforcement authorities.
- Each mine has to have two mine rescue teams ready as long as workers are underground.
- Small and isolated mines can have agreements with other mines to share mine rescue teams.
- The primary rescue teams have to be on-site in a reasonable time.

➡ **Due to this it is necessary to have well-trained people for mine rescue and disaster management.**

The Mine Rescue Program at Colorado School of Mines

History and structure:

- Founded in the year 2009
- In the year 2010 introduction of the first all-female team
- Today divided into three teams:
    - Men's Team
    - Women's Team
    - Underclassmen Co-ed Team
- Membership voluntary

The teams' structure:

- 7 exploration members per team (captain, gas man, map man, first aid specialist, co-captain, 2 fresh air base)
- Per team 2 primary technicians and 3 first aid specialists

The Mine Rescue Program at Colorado School of Mines

The Mine Rescue Program Equipment:

- 6 Monitron BG-4 Units
- 5 New Sentinel BG-4 Units
- 1 RZ-25 Testing Unit
- 2 Specialized Mine Rescue Carts
- 2 MX6 Industrial Scientific Gas Meters
- 12 Full Sets of Firefighter Bunker Gear
- 1 Permanent MineARC Mine Rescue Chamber

The Mine Rescue Program at Colorado School of Mines

The Edgar Mine:

- In possession by the CSM since 1921
- Distance about 30 minutes by car from the CSM Campus
- Contains a mine rescue station, a classroom, a confined trainings maze, and an explosives research lab

Underground exercises in the Edgar Mine:

- Offers the opportunity to train in a realistic underground mine environment
- Possibility to simulate mine disasters with smoke creation, limited sight, patient extraction and obstacles
- Training of airlock constructions and temporary stoppings possible

The Mine Rescue Program at Colorado School of Mines

Mine Rescue Team competitions:

- Each team takes part in at least one competition each year.
- Competitions testing the knowledge of mine rescue rules and regulations by:
  - Written Test
  - Field Problem
  - Technical Competition
  - First Aid Competition

- Each year all three teams take part in a professional mine rescue contest.
- Every second year the Biennial Intercollegiate Mine Emergency Response Development Exercise (MERD) takes place at the CSM in the Edgar Mine with teams from several international mining schools.

Competitions are a great way to train team work, expand networks, knowledge exchange and much more!

Next MERD at CSM on February 16 – 17 2017!

Mine Rescue and Disaster Management in the German Mining Industry

- For nearly two decades the number of mines has decreased
- The distances between operating mines has become bigger
- Another tendency is the reduction of employees
- Due to the demographic problem more and more experienced mine rescue team members retire.

➡ These factors have greatly reduced the number of mine rescue teams in Germany.

At the same time the regulations have stayed nearly the same:

- Each mine has to have a mine rescue team or an agreement with another mine's mine rescue team.
- Small mines can have a mine rescue team with less members in it but still enough to fulfill the necessary tasks or act as guides for other teams.
- The first mine rescue team has to arrive at the place of need in a reasonable time.
- Mine rescue team members have to be trained and educated for the task. -> This takes more than a few days lecture!

➡ **It is important to prepare the mining students for their future tasks!**

Mine Rescue, Disaster Management and Health & Safety Education at TU Bergakademie Freiberg

A long standing tradition:
Mine rescue training at the BG RCI in Leipzig:

- For decades mining engineering students have taken part in a supplementary mine rescue course at the BG RCI main rescue centre in Leipzig
- Each student needs the medical certificate G26/3.
- In the block course theoretical knowledge about mine rescue structures, tasks, responsibilities and organization is taught.
- The course is completed with a „hot“ emergency practice
  - in the replica of a mine at the BG RCI
  - under breathing apparatus
  - in a heated atmosphere with limited sight
  - in a obstacle course with attached gym

Mine Rescue, Disaster Management and Health & Safety Education at TU Bergakademie Freiberg

The next stage (2012):
Incident control and management course:

- **Main tasks of a mining engineer during a mine disaster are leadership, organization and technical management**

To prepare the students for these tasks the TU BAF

- added a course on incident control and management
- has guest lecturers who are mainly working as expert consultants in mine management in Germany

The course contents are:

- Incident command structures and drill (adapted from military command structures)
- Incident management
- Use of control and software tools
- Communication
- Organization of incident control offices
- Public relations and media communication

New Mine Rescue Modules 2015 - Target Group

Disaster management and incident control knowledge is requested in nearly every kind of industry

Participation in the new courses is open to all students at Technical University Bergakademie Freiberg, with a special focus on students in the following programs

- **Mining Engineering**
- **Tunneling and Specialized Underground Construction**
- **Petroleum Engineering**
- **Mine Surveying**
- **Chemical Engineering**
- **Mechanical Engineering / Energy and Gas Technology**
- **Business Engineers in the Raw Materials Industry**

Structure of the New Program

The program is split into two modules:

Module 1:

„Disaster Management and Incident Command in the Raw Materials Industry“ (Sicherheit und Rettungswerke in der Rohstoffindustrie) –

- 2 semester course
- Theoretical lectures and practical exercises (role plays) in disaster management, incident command, incident communication, public communication, etc.

➢ No admission restrictions

Module 2:

„Student Mine Rescue Teams“ (Studentische Gruben- und Gasschutzwehr)

- 2 semester course
- Practical formation and training including first aid, underground exercises, command exercises, aligned with the German mine rescue training plan , supervised by professional trainers

➢ Admission restrictions:

- ➢ Medical clearance to work underground
- ➢ Medical clearance to work under rebreather apparatus (G 26/3)
- ➢ Passing all subjects in module 1

Module 1 Basics and Theory

- No admission requirements
- Duration: 2 Semester – starting in winter term
- Content overview
    - Risk assessment, prevention – minimization and control
    - Basics for rescue operations in the raw materials industry
    - Structure and function of disaster management structures
    - Incident command and staff work
    - Legal basics and requirement for rescue and safety operations in the raw materials industry
    - Organization und structure of an incident command
    - Successful communication with public and media
    - Cooperation with the authorities and prosecutor – Dos and Don’ts
    - Staffing and equipment
    - …
- Regular guest lecturers from industry, authorities and media specialists.
- This module is pre-requisite for the practical student mine rescue training (module 2)

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Module 1

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Daten:	RETWRO.MA.	Stand: 15.07.2015	Start: WiSe 2015
Modulname:	**Sicherheit und Rettungswerke in der Rohstoffindustrie**		
(englisch):	Safety and Rescue Deployment in the Extractive Industry		
Verantwortlich(e):	Mischo, Helmut / Prof. Dr.-Ing.		
Dozent(en):	Mischo, Helmut / Prof. Dr.-Ing. Weyer, Jürgen / Dr.-Ing.		
Institut(e):	Institut für Bergbau und Spezialtiefbau		
Dauer:	2 Semester		
Qualifikationsziele / Kompetenzen:	Den Teilnehmern werden der Aufbau und Organisation von Rettungswerken im industriellen Umfeld, die Aufgaben und Funktionen von Gruben- und Gasschutzwehren sowie das übergreifende Krisenmanagement vermittelt. Die Teilnehmer werden befähigt Rettungswerke in der Rohstoffindustrie zu entwickeln, bewerten und bei der Durchführung selbstständig mitzuwirken.		
Inhalte:	Es werden Strukturen und Organisation von Rettungswerken in der Rohstoffindustrie am Beispiel der rechtlichen Grundlagen, Strukturen und Abläufe innerhalb Gruben- und Gasschutzwehren in Deutschland sowie Grundlagen der Kommunikation in Krisenfällen vermittelt. Die im Bergbau und der Rohstoffindustrie auftretenden Gefahrquellen, Präventionsmaßnahmen, Gefahrbekämpfung, Sofortmaßnahmen, Organisation des Krienstabs, Stabsarbeit und Aufgabenverteilung werden gelehrt. Darüber hinaus werden Grundlagen der technischen Ausrüstung, Atmung und Atemschutz vermittelt.		
Typische Fachliteratur:	Hermülheim, W.; "Handbuch für das Grubenrettungswesen im Steinkohlenbergbau" VGE Verlage - 2007 Enright, C.; Ferriter, R. L.;"Mine Recue Manual"; Society for Mining, Metallurgy & Exploration - 2014		
Lehrformen:	S1 (WS): Grundlagen der Rettungswerke I / Vorlesung (2 SWS) S1 (WS): Grundlagen der Rettungswerke I - Blockkurs / Übung (2 SWS) S2 (SS): Grundlagen der Rettungswerke II / Vorlesung (2 SWS) S2 (SS): Grundlagen der Rettungswerke II - Blockkurs / Übung (1 SWS)		
Voraussetzungen für die Teilnahme:			
Turnus:	jährlich im Wintersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: in Prüfungsvariante 0: PVL: Belege oder in Prüfungsvariante 1: MP/KA (KA bei und mehr Teilnehmern) [90 min] PVL müssen vor Prüfungsantritt erfüllt sein bzw. nachgewiesen werden.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): in Prüfungsvariante 0: oder in Prüfungsvariante 1: MP/KA [w: 1]		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h.		

Module 2 – Practical Student Mine Rescue Training

- Admission requirements:
    - Medical clearance to work underground
    - Medical clearance to work under rebreather apparatus (G 26/3)
    - Attending all subjects in module 1
- Duration 2 semesters – starting in winter term
- Content:
    - training under normal and simulated „hot“ situations to improve the theoretical knowledge about the equipment, the team structures, first aid, fire training, rope rescue, etc.
    - Practical exercises along the whole range of mine rescue and gas protection tasks
    - Assessment of real life incidents – development and application of own strategies
    - First aid and resuscitation
    - Exercises in both in incident command structures as well as trooper
    - Role-Plays in disaster management, including media communication
- All exercises aligned with the German mine rescue training plan , supervised by professional mine rescue trainers

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Daten:	STUGRU.MA.	Stand: 15.07.2015	Start: WiSe 2015
Modulname:	**Studentische Gruben- und Gasschutzwehr**		
(englisch):	Student Mine Rescue Team		
Verantwortlich(e):	Mischo, Helmut / Prof. Dr.-Ing.		
Dozent(en):	Mischo, Helmut / Prof. Dr.-Ing. Weyer, Jürgen / Dr.-Ing.		
Institut(e):	Institut für Bergbau und Spezialtiefbau		
Dauer:	2 Semester		
Qualifikationsziele / Kompetenzen:	Die Teilnehmer werden befähigt im Ereignisfall Rettungswerke anzuwenden, Einsätze von Gruben- und Gasschutzwehren zu planen und unterstützend in der betrieblichen Stabsarbeit tätig zu werden.		
Inhalte:	Strukturen von Rettungswerken sowie Einsatzszenarien von Gruben- und Gasschutzwehren werden theoretisch und praktisch geübt.		
Typische Fachliteratur:	Hermülheim, W.; "Handbuch für das Grubenrettungswesen im Steinkohlenbergbau" VGE Verlage - 2007 Enright, C.; Ferriter, R. L.;"Mine Recue Manual"; Society for Mining, Metallurgy & Exploration - 2014		
Lehrformen:	S1 (WS): Einsatz von Grubenrettungs- und Gaswehrtrupps / Vorlesung (2 SWS) S2 (SS): Einsatz von Grubenrettungs- und Gaswehrtrupps / Vorlesung (2 SWS) S1 (WS): Einsatz von Grubenrettungs- und Gaswehrtrupps / Übung (2 SWS) S2 (SS): Einsatz von Grubenrettungs- und Gaswehrtrupps / Übung (2 SWS)		
Voraussetzungen für die Teilnahme:	Teilnahme des Moduls "Rettungswerke in der Rohstoffindustrie" Im Vorlesungszeitraum gültige Untersuchung G26-3		
Turnus:	jährlich im Wintersemester		
Voraussetzungen für die Vergabe von Leistungspunkten:	Voraussetzung für die Vergabe von Leistungspunkten ist das Bestehen der Modulprüfung. Die Modulprüfung umfasst: MP/KA* (KA bei 0 und mehr Teilnehmern) [90 min] * Bei Modulen mit mehreren Prüfungsleistungen muss diese Prüfungsleistung bestanden bzw. mit mindestens "ausreichend" (4,0) bewertet sein.		
Leistungspunkte:	4		
Note:	Die Note ergibt sich entsprechend der Gewichtung (w) aus folgenden(r) Prüfungsleistung(en): MP/KA* [w: 1] * Bei Modulen mit mehreren Prüfungsleistungen muss diese Prüfungsleistung bestanden bzw. mit mindestens "ausreichend" (4,0) bewertet sein.		
Arbeitsaufwand:	Der Zeitaufwand beträgt 120h.		

Mine Rescue, Disaster Management and Health & Safety Education at TU Bergakademie Freiberg

Support and equipment for the mine rescue teams:

- Supported by many corporate sponsors in the mining industry by
  - Funding for travel and projects
  - Equipment donation
  - Volunteering time as experts and trainers

For example:

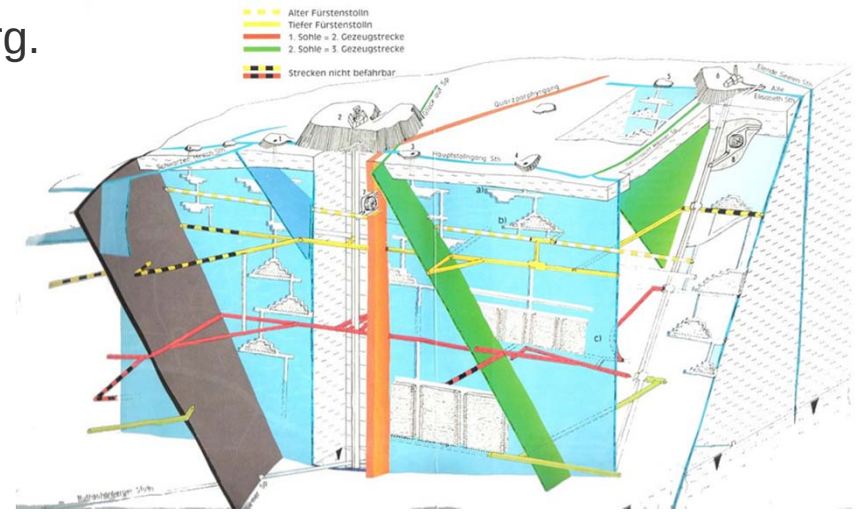
- Drägerwerk AG & Co. KGaA has donated five Dräger PSS® BG4, breathing apparatus, and gas detection devices
- MSA Auer GmbH has donated two AirElite 4h breathing apparatus and trainer units and gas detection devices
- Wismut GmbH is sponsoring student theses and project works
- BGRCI has been sponsoring the mine rescue courses for decades
- Local companies are supporting with donations (jackets, helmets etc.)
- Training together with / under supervision of professional mine rescue teams

Training Opportunities at the Freiberg Research Mine FLB (Forschungs- und Lehrbergwerk)

The FLB is currently developing an extended underground mine rescue training area, thus supplying a real-life training possibility with a wide range of possible scenarios and exercises.

The student mine rescue team will support and complement the professional mine rescue structure at the FLB (active deployment limited by legal and liability constrains).

Graduates from the student mine rescue team may qualify as future mine rescue team members of the FLB, once they become staff members of TU Bergakademie Freiberg.



Mine Rescue, Disaster Management and Health & Safety Education at TU Bergakademie Freiberg

- Team structure organization by mining students of the TU Bergakademie Freiberg under supervision of TUBAF staff


- Planning to participate in MERD 2017 at Colorado School of Mines
- In future running MERDs in central Europe together with the other mining schools

Thank you for your attention

Glück Auf!