

MGEN 6050: Mining Ventilation & Underground Environmental Control (3 credits)

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Office Hours: By appointment

Zoom/IM/Canvas Conference Office Hours: By appointment

Course Description

Mining Ventilation & Underground Environmental Control is a graduate-level course focused on the principles and practices of providing a safe and healthy working environment in underground mining operations. The course covers various topics, including mine ventilation systems, air quality monitoring, heat and humidity control, dust and gas management, and emergency preparedness. Through theoretical instruction, case studies, and practical exercises, students will gain a comprehensive understanding of the design, operation, and maintenance of ventilation systems in underground mining environments.

Course Outcomes

1. To develop a thorough understanding of mine ventilation principles and their application in underground mining operations.
2. To familiarize students with the design, operation, and maintenance of ventilation systems and equipment.
3. To provide students with the knowledge and skills to monitor and control air quality in underground mines.
4. To explore strategies for managing heat, humidity, dust, and gas hazards in underground mining environments.
5. To enhance students' abilities to analyze and address ventilation-related challenges and emergencies.
6. To encourage critical thinking and problem-solving skills through case studies and practical exercises.

Grading Policy

Students will be evaluated through assignments, quizzes, exams and class project. Student professionalism demonstrated through attendance and respect for others will also be reflected in evaluation. Grading will follow the following scheme:

Homework 20%

Term project 10%

Reading quizzes 20%

Mid-term exam 20%

Final exam 20%
Professionalism 10%

Subject to change per instructor's discretion. Grading will follow the University of Utah grading scale of:

0%- 59.5%	60% - 64.5%	65%- 69.5%	70% - 74.5%	75%- 79.5%	80%- 84.5%	85%- 89.5%	90%- 94.5%	95%- 100
E	D-	D+	C-	C+	B-	B+	A-	A

Course Schedule

Week 1: Introduction to Underground Environmental Control

- Course overview and objectives
- Importance of ventilation and environmental control in underground mining
- Regulatory requirements and industry standards

Week 2: Mine Ventilation Principles and Fundamentals

- Basic principles of mine ventilation
- Mine ventilation system components
- Laws of airflow and pressure relationships

Week 3: Ventilation Network Design and Planning

- Determining ventilation requirements
- Ventilation network design and optimization
- Ventilation simulation and modeling tools

Week 4: Mine Ventilation Equipment and Systems

- Fans and blowers: types, selection, and performance
- Ducting and airways: design, sizing, and layout
- Auxiliary ventilation systems

Week 5: Air Quality Monitoring and Control

- Air quality parameters and standards
- Sampling techniques and instrumentation
- Control measures for dust, gases, and contaminants

Week 6: Heat and Humidity Control

- Thermal environment in underground mines
- Heat sources and heat transfer mechanisms
- Cooling methods and humidity management

Week 7: Ventilation System Operation and Maintenance

- Ventilation system operation and control strategies

- Maintenance practices and inspections
- Troubleshooting ventilation system problems

Week 8: Mine Dust Control

- Dust generation and health hazards
- Dust suppression and control techniques
- Personal protective equipment for dust control

Week 9: Gas Management in Underground Mines

- Types and sources of gases in mines
- Gas detection and monitoring systems
- Control and mitigation of gas hazards

Week 10: Emergency Preparedness and Response

- Emergency preparedness planning
- Emergency response procedures and protocols
- Evacuation strategies and emergency shelters

Week 11: Case Studies in Ventilation and Environmental Control

- Analysis of real-life ventilation and environmental control challenges
- Lessons learned and best practices
- Group discussions and presentations

Week 12: Ventilation Economics and Energy Efficiency

- Cost analysis and optimization of ventilation systems
- Energy-efficient ventilation strategies
- Environmental sustainability considerations

Week 13: Ventilation in Challenging Mining Environments

- Ventilation in deep and high-stress mines
- Ventilation in narrow vein and orebody-specific conditions
- Ventilation challenges in longwall and room-and-pillar mining

Week 14: Ventilation Risk Assessment and Management

- Hazard identification and risk assessment in ventilation systems
- Ventilation-related safety management systems
- Continuous improvement and auditing of ventilation

Finals Week:

Note: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas under Announcements.

University Policies

1. ***The Americans with Disabilities Act.*** The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access.
 - ***If in-class attendance is a necessary component of the course for pedagogical reasons (e.g., laboratories, studios, or artistic training), state it explicitly.***

Use this standard language: “Given the nature of this course, attendance is required and adjustments cannot be granted to allow non-attendance. However, if you need to seek an ADA accommodation to request an exception to this attendance policy due to a disability, please contact the Center for Disability and Access (CDA). CDA will work with us to determine what, if any, ADA accommodations are reasonable and appropriate

2. ***University Safety Statement.*** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit <https://safeu.utah.edu>
3. ***Addressing Sexual Misconduct.*** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

4. ***Academic Misconduct Statement.*** It is expected that students adhere to University of Utah policies regarding academic honesty, including but not limited to refraining from cheating, plagiarizing, misrepresenting one's work, and/or inappropriately collaborating. This includes the use of generative artificial intelligence (AI) tools without citation, documentation, or authorization. Students are expected to adhere to the prescribed professional and ethical standards of the profession/discipline for which they are preparing. Any student who engages in academic dishonesty or who violates the professional and ethical standards for their profession/discipline may be subject to academic sanctions as per the University of Utah's Student Code:

<https://regulations.utah.edu/academics/6-410.php>