Mining Engineering Department
College of Mines and Earth Sciences
University of Utah

MG EN 5050:

Mine Ventilation and Environmental Control

Course Syllabus

Fall, 2023

Instructor: Dr. Karoly (Charles) Kocsis, P.Eng.

MG EN 5050 Course Syllabus:
Mine Ventilation and Air Conditioning (Fall 2023)

1) Instructor:

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2) Class schedule:

- Scheduled Classes: **12:55PM** to **1:45PM** (Mondays & Wednesdays) in WBB 102
- Labs: 8 laboratory sessions on Wednesdays from **2:00PM - 2:50PM**
- Office Hours: **2:00PM-4:00PM** on Mondays, and **3:00PM-5:00PM** on Wednesdays.

3) Prerequisite/Corequisite:

- Prerequisite: Applied Fluids, Pumping and Drainage
- Corequisite: Engineering Thermodynamics

4) Course description:

The mine ventilation course (MG EN 5050) covers the following topics: (**1**) Mechanics of fluid flow – Laminar & turbulent, (**2**) Underground ventilation surveys, (**3**) Ventilation network analysis, (**4**) Application of engineering principles in ventilation planning, (**5**) Ventilation system design – Primary & auxiliary, (**6**) Mine ventilation fans – Primary & auxiliary (**7**) Psychrometry – Study of moisture in the air, (**8**) Contaminant control – Dust gases, (**9**) Mine climate control using mechanical and natural ventilation methods.

In addition, the course also covers: (**10**) Heat sources and flow into mine openings – Strata, auto-compression, equipment, (**11**) Analysis of underground climatic conditions by means of climatic modelling techniques, (**12**) Underground work comfort analysis.

5) Course objectives:

The main objectives of this course are:

1) Gain an in-depth understanding of the properties and behavior of the mine air as it flows through production stopes, various mine openings and auxiliary ducting systems.
2) Perform efficient underground mine ventilation surveys (barometry and tracer gas). Determine fan operating points. Assess the effects of natural ventilation pressure.

3) Develop capacity in evaluating and controlling the quality of the mine air, while providing adequate air volumes to the development workings and throughout the mine.
4) Assess the climatic conditions in the production workings, dead-end development headings and throughout the mines. Analyze key climatic parameters of the ventilating air and their effect on its cooling capacity and in the end work comfort.
5) Gain an in-depth understanding and knowledge to perform mine ventilation planning exercises, while focusing on short-term, medium-term and long-term total mine air volume requirements.
6) Size and select primary and auxiliary fans.
7) Design efficient primary and auxiliary ventilation systems by means of ventilation modeling and simulation techniques using mine ventilation software packages (e.g. Ventsim^{TM}, VnetPC^{TM}).

6) Topics to be covered:

The main topics to be covered by the lectures are:

1) Fluid Mechanics
2) Underground Ventilation Systems
3) Incompressible Flow Relationship
4) Ventilation Surveys (barometry and tracer gas)
5) Mine Ventilation Network Analysis
6) Mine Ventilation Planning
7) Pressure Generators – Fans (surface, booster, auxiliary)
8) Ventilation System Design (simulation techniques)
9) Psychrometry (study of moisture in mine air)
10) Underground Mine Climate – Analyze climatic parameters and determine their effects on work comfort in the production stopes, dead-end development headings.
11) Dust and Gases in Underground Mines
12) Coal Mine Ventilation Systems
13) Metal Mine Ventilation Systems
14) Ventilation Automation, and Ventilation-On-Demand (VOD) Control Systems

8) Laboratory sessions:

The main objectives for the laboratory experiments are to train the MG EN 5050 class in laboratory procedures that support concurrent instruction being given during lecture hours.

Test No.	Description
(1)	Pitot tube and air pressure measurements.
(2)	Flow through a rough surface duct.

(3) Flow through a smooth surface duct.
(4) Fan testing and fan characteristic curves .
(5) Mine ventilation modeling (using VnetPC Pro+ or Ventsim^{TM}).
(6) Vent survey in a simulated coal/metal mine model.
(7) Vent survey in an auxiliary ventilation model.
(8) Vent lab test.

NOTES:

- No laboratory session during the week of the SME Annual Meeting
- No laboratory session during the fall break

8) Textbooks:

1) Malcolm J. McPherson, "*Subsurface Ventilation and Environmental Engineering*", 1st Edition, 1993, Chapman & Hall Inc., 29 West 35th Street, New York, USA.
2) Hartman, H. L., J. M. Mutmansky, R. V. Ramani, and Y. J. Wang, "*Mine Ventilation and Air Conditioning*", 3rd Edition, 1997, John Wiley & Sons, New York.

9) ABET student learning outcomes:

The primary ABET student outcome for this course:

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

ABET Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and professional conduct that students acquire as they progress through the mining engineering program.

10) Exams (Midterm and Final):

To be determined.

11) General instructions:

- Disruptive behavior in class will not be tolerated.
- Cheating is not permitted. Cheating is defined as attempts to get credit in a way that is dishonest, disrespectful, irresponsible, and unfair.
- Cell phone usage is not permitted.
- Any student needing special accommodations for class or for taking exams must notify the instructor in advance.
- Late assignments will only be accepted when reasonable justification is presented for a new deadline.
- Class attendance is mandatory, and it will be considered for final grading. Please notify the instructor verbally or by email if there is a reasonable/realistic reason to miss a lecture or lab session. For missing quizzes, assignments, exams, and lab sessions the grade is "zero".

12) Grading:

- Assignments (Problems, Presentations): 15%
- Mid-Term Exam: 25%
- Lab Work (10) + Lab reports: 25%
- Final-Exam (Closed Book): 35%
- Grading weight may change based upon assignments difficulty, and laboratory work & reporting

13) Marking scheme:

- A (95% - 100%)
- A- (90% - 94.9%)
- B+ (86% - 89.9%)
- B (80% - 85.9%)
- B- (75% - 79.9%)
- C+ (70% - 74.9%)
- C (66% - 69.9%)
- C- (63% - 65.9%)
- D (59% - 62.9%)
- F (<59%)

14) Other notes:

1) Extra credit will be given for regular class attendance, classroom discussion, classroom behavior, and timely student & faculty evaluation.
2) Unacceptable behavior during lectures and laboratory sessions can affect the final grade to an extent deemed appropriate by the course instructor.
3) Final grades may be curved up or down relative to this grading scale based on the average performance of the class.
4) The syllabus is tentative and is subject to change as the semester progresses.

15) Important safety information

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 **801-581-COPS** (801-585-2677). Sign up for emergency alerts in CIS and you will receive important alerts and safety messages regarding campus safety via text. For more information regarding safety and to view available training resources, including helpful videos, visit https://safeu.utah.edu and https://cmes.utah.edu/safety/index.php.

16) On-campus resources:

Office of Equal Opportunity and Affirmative Action | Park Building, room 135 | 801-581-8365 Office of the Dean of Students | Union Building, room 270 | 801-581-7066
The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability.

17) Americans with Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in a class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union, Phone: 801-581-5020 (V/TDD) to make arrangements for accommodations. All written information in a course can be made available in an alternative format with prior notification to the Center for Disability Services.