MIN ENG 4113: **Mine Atmosphere Control (Lecture & Lab)**

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**Class Timings:**  
**On campus:**  
**Lecture:** Monday, Wednesday, Friday 9:10 am to 10:10 am  
260 Toomey Hall  
**Laboratory:** Tuesday, Thursday 9:10 am to 10:10 am  
260 Toomey Hall  

**Distance Students:** Material (Lectures, Assignments, Homework) will be uploaded every Thursday with due date duly mentioned for assignments/homework/quizzes

**Course Description:** This course is focused on introduction of mine ventilation, principles of fluid mechanics and thermodynamics applicable to mine ventilation circuits, principles of airflow, mechanical and natural ventilation, and strata gas drainage.

**Course Objectives:** Upon completion of this course, students will be able to understand and design mine ventilation circuits, comprehend the principles of airflow, and will be able to recognize different types of fans, their properties, and application to mine ventilation circuits. They will also be able to understand the hazards and risks associated with various mine gases and dusts, explosions and fires in mines and application of mitigation measures using ventilation circuits. The students will also be able to appreciate the importance of natural ventilation and its inclusion in the ventilation circuit along with mechanical ventilation.

**Prerequisites:** Engineering standing, introductory courses of fluid mechanics and thermodynamics (good to have but not mandatory)

**Text Material:**  
1. *Mine ventilation and air conditioning* by Hartman, Howard L (any edition available)  
2. *Subsurface ventilation and environmental engineering* by Malcolm J. McPherson  
   ISBN: 0412353008, 9780412353000  
3. *Class Notes*
Course Material: Course material (including lectures, assignments, homework, quiz, project, and exams) will be uploaded on blackboard site. I have combined different courses to 1A (on Campus) section. All the material for quizzes, exams, and lectures will be available at 1A section. The material for Distance class (the recordings and live information) will be uploaded inside the distance section of Blackboard i.e. MIN ENG 4113-1DIS. Only distance students will have access to the recordings and live information. The assignments and homework will be due on subsequent Monday i.e. approximately after 10 days unless mentioned otherwise. The due date for quiz, project, and exams will be posted with the exams.

Communication: Prefer mode of communication is WebEx, emails or blackboard forum. Skype conference may also be scheduled, if needed. You are encouraged to email me without hesitation 24/7.

Honor code is strictly followed. All assignments, homework, and exams are individual tasks unless clearly specified as group assignments, homework, or exams. The Honor Code can be found at this link: http://stuco.mst.edu/about/honor.shtml. Please read and reflect upon the Honor code and its emphasis on HONESTY and RESPECT.

<table>
<thead>
<tr>
<th>Description</th>
<th>MIN ENG 4113 (1A &amp; 1DIS) Mine Atmosphere Control (Lecture)</th>
<th>MIN ENG 4113 (3A &amp; 3DIS) Mine Atmosphere Control (Lab)</th>
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<tbody>
<tr>
<td>Grading</td>
<td>Quizzes/Assignment 20%</td>
<td>Term Paper 20%</td>
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<td>Homework 40%</td>
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<td>Final Project/exam 20%</td>
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<tr>
<td>Week 1</td>
<td><strong>Introduction to mine ventilation</strong></td>
<td><strong>Topic Selection</strong></td>
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<td>Basics of mine ventilation, importance of mine ventilation,</td>
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<td>purpose of mine ventilation, factors affecting underground</td>
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<td>environment, air-conditioning and heating, A brief history</td>
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<td>of mine ventilation, the relationship between ventilation</td>
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<td>and other subsurface systems</td>
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<td><strong>Assignment 1</strong></td>
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<td>Week 2</td>
<td>**Introduction to fluid mechanics and thermodynamics</td>
<td><strong>Topic finalizing and literature search</strong></td>
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<td>principles applicable to mine ventilation**</td>
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<td>Concept of fluid, fluid pressure, fluids in motion,</td>
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<td>continuity equation, Bernoulli’s</td>
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| Week 3 | **Introduction to fluid mechanics and thermodynamics principles applicable to mine ventilation**  
Frictional losses in turbulent flow, Chezy-Darcy equation, coefficient of friction  
**Quiz** | Literature search, references, material and methodology/strategy |
|---|---|---|
| Week 4 | **Principles of air flow**  
Gas laws, Ideal gas, effects of altitude, nature and composition of air, gas laws and gas constants  
**Homework 2** | 1st draft |
| Week 5 | **Fundamentals of steady flow thermodynamics**  
First law of thermodynamics, enthalpy and the steady flow energy equation, specific heats and their relationship to gas constant  
**Assignment 2** | Amendments, reviews, comments |
| Week 6 | **Fundamentals of steady flow thermodynamics**  
Second law of thermodynamics, frictional flow, entropy  
**Home Work 3** | 2nd Draft |
| Week 7 | **Fundamentals of steady flow thermodynamics**  
Thermodynamic diagrams  
**Mine fans**  
Blower, exhaust and booster systems  
**Final Project** | Final paper |
| Week 8 | **Gases and dusts & their control**  
Mines gases and their drainage, dust and controls techniques  
**Home Work 4** | Publication strategies/grading |
Video Communication Center (VCC): [http://vcc.mst.edu](http://vcc.mst.edu)

The VCC web site [http://vcc.mst.edu](http://vcc.mst.edu) has information to help distance students. There is a lot of information available at the VCC website for students regarding course access, participating in live classes, lectures, and recording download. There is additional information on the VCC Students page at [http://vcc.mst.edu/stus/updatedstus/](http://vcc.mst.edu/stus/updatedstus/)

LEAD Learning Assistance: [http://lead.mst.edu](http://lead.mst.edu)

The Learning Enhancement Across Disciplines Program (LEAD) sponsors free learning assistance in a wide range of courses for students who wish to increase their understanding, improve their skills, and validate their mastery of concepts and content in order to achieve their full potential. LEAD assistance starts no later than the third week of classes. Check out the online schedule at [http://lead.mst.edu/assist](http://lead.mst.edu/assist), using zoom buttons to enlarge the view. Look to see what courses you are taking have collaborative LEAD learning centers (bottom half of schedule) and/or Individualized LEAD tutoring (top half of the schedule). For more information, contact the LEAD office at 341-7276 or email lead@mst.edu.

The Burns & McDonnell Student Success Center:

The Student Success Center is a centralized location designed for students to visit and feel comfortable about utilizing the campus resources available. The Student Success Center was developed as a campus wide initiative to foster a sense of responsibility and self-directedness to all S&T students by providing peer mentors, caring staff, and approachable faculty and administrators who are student centered and supportive of student success. Visit the B&MSSC at 198 Toomey Hall; 573-341-7596; success@mst.edu; Facebook: [www.facebook.com/mstssc](http://www.facebook.com/mstssc); web: [www.studentsuccess.com](http://www.studentsuccess.com)

“If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with me early in the semester. You will need to request that the Disability Services staff send a letter to me verifying your disability and specifying the accommodation you will need before I can arrange your accommodation.”