MINE 393: Special Topics
Mine Pollution Control

Fall 2014

Instructor

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Office Hours

Online: Monday, 3:00 – 5:00 PM
In person: open door

Lecture Time/Location

Self-paced, online. Lecture hours = 3. Lab hours = 0.

Overview

This special topics course will cover environmental pollution control as it applies to surface and underground mining systems. General areas of study will include environmental ethical considerations, stakeholder evaluation, mine permitting, and environmental law. Students will also learn the engineering principles of several environmental monitoring and pollution control activities, including material balance calculations, soil management, hydrologic evaluation, fine waste disposal, and remediation of mine influenced waters.

The course will be delivered as a self-paced online course. Course materials and assignments will be distributed via eCampus, and students are encouraged to use various online tools to engage discussions between the instructor and their peers. Details are provided below (*Course Structure*).

Prerequisites

MINE 205 and MINE 206

Required Text

None. Students will be provided required readings which consist of compilations from various sources.

Reference Texts

Craynon, John R. (2013). Environmental Considerations in Energy Production. SME.

Masters, Gilbert M. and Wendell P. Ela (2007). Introduction to Environmental Engineering and Science. Third Edition. Prentice Hall.

McLemore, Virginia T. (2008). Basics of Metal Mining Influenced Water (Management Technologies for Metal Mining Influenced Water, Volume 1). SME.

Expected Learning Outcomes

The next generation of mining engineers must not only exhibit technical proficiency in the traditional disciplines, but they must also have the ability to intelligently contribute to dialogue between the various mining stakeholders. Tomorrow's mining engineer must be mindful of several salient social issues, including the environmental impact of minerals production. Considering these goals, this course includes introductory material on several mine environmental issues.

Having successfully completed this course, students will be able to:

1) *Determine* environmental stakeholder groups and *explain* the legal and ethical responsibilities to these groups;
2) *List* and *interpret* relevant laws, statutes, regulations, and court findings pertaining to specific mine environmental issues
3) *Explain* the potential environmental impacts and *determine* the permitting requirements associated with a particular mine design;
4) *Describe* major soil/land pollution impacts of mining and *design* systems for monitoring, control and remediation;
5) *Describe* major hydrological/water pollution impacts of mining and *design* systems for monitoring, control and remediation;
6) *Describe* the basic elements required to establish an environmental management system for mining systems.

Course Structure/Topics

This course will delivered using an online format. No formal class meetings will be scheduled. All material and assignments will be distributing using the eCampus website.

The course material will be delivered in five modules, with the course schedule following a three week pattern. Each module will be available for three weeks, and students are encouraged to work at their own pace within those three weeks. All material for will be released during the first week of the module, and all assignments must be completed and submitted within the module period. At the end of the three week period, the assignments will close, and material for the next module will be released. This pattern will be repeated over the 15 weeks of the course. The final week will be dedicated to review and the final exam.

The course modules will cover the following material:

No.	Topic	Released	Due
1)	Course Introduction & Environmental Law	8/18/2014	9/7/2014
2)	Permitting & Environmental Material Balances	9/8/2014	9/28/2014
3)	Soil Engineering & Land Pollution Control	9/29/2014	10/19/2014
4)	Hydrology & Fine Waste Disposal	10/20/2014	11/9/2014
5)	Water Quality Monitoring & Control	11/10/2014	12/7/2014

Course Material

Each of the five modules will consist of the following elements:

1) *Reference text*. Readings will consist of notes provided by the instructor. No formal textbook will required. These notes will be released individually for each module, but they will form a consistent document (with consistent page numbering) by the end of the year. A tentative table of contents will be released at the beginning of the semester.

2) *Lecture videos*. Videos will be structured after those found on Khan Academy (www.khanacademy.org). Each video will be approximately 10 minutes in length and address a single topic, calculation, example or skill. These videos will supplement (though not necessarily duplicate) the material found in the reference. Each module will consist of 5 to 15 videos. A list of prospective videos is posted below; however, additional videos will be added as needed per the direction of the class. Students may request additional videos if certain topics remain unclear.

3) *Video quizzes*. Each video will be accompanied by a (very) short comprehension quiz. These quizzes are meant be to be taken immediately after watching the video to assess the student's instant reaction and recall. Students should use these videos to determine which concepts are still unclear. These quizzes will be graded for both accuracy and completion.

4) *Discussion question*. To promote a more communal learning experience, open-ended discussion questions will be posted to an online forum open to the class. These discussion questions will facilitate critical thinking, debate, and peer review amongst the class members. Each module will contain approximately 2-3 discussion questions. Active participation is expected, and the grade for this section will be based on the frequency and thoughtfulness of the responses.

5) *Homework assignments*. Homework for each module will vary widely, depending on the specific content. Individual assignments may include: literature research, essay/report writing, problem sets, small design projects, or engineering data analysis. The approach and techniques required for the homework will be gleaned from the videos and required readings. Each module will contain 2 – 3 moderate assignments. These assignments will be graded for accuracy; however, group work with other peers in the class is encouraged.

6) *Exam*. Each module will culminate in a standard online exam. The exams will be noncumulative, and like other material, the exams will be available throughout the module period. These exams will include all types of questions, including multiple choice, true-false, short answer, and problem sets, depending on the module material. The exams will be open book/resource, but individual work is required.

This class will also include an oral final exam. Students will need to schedule a time between 12/11/2014 and 12/16/2014 to meet with the instructor, either face-to-face or via online video chat. During this period (approximately 1 hour), the instructor will administer an oral final exam. More details will be provided around Thanksgiving recess.

Grading

Final grades will be based upon the successful completion of the homework, quizzes, module exams, a final exam, and the discussion questions.

Discussion Questions	15%
Video Quizzes (~73)	15%
Module Exams (5)*	28%
Final Exam	7%
Homework (~14)	35%

*If all quizzes and homework assignments are fully completed on time, the lowest module exam score will be dropped.

Letter grades will be assigned on a standard 10 point scale (90 – 100 = A; 80 – 89 = B; 70 – 79 = C; 60 – 69 = D; <59 = F). Plusses and minuses will be added on 3 point increments.

Data Integrity

Many portions of this class, including the homework and mini-projects will require significant computer usage. While computer crashes and malfunctions do happen, students should take every initiative to ensure that such misfortunes do supersede the responsibility to complete and submit assignments in a timely manner. All critical documents should be stored in at least two media whether physical or virtual. This instructor STRONGLY recommends real-time online backup and/or cloud storage. Several free options are available online (Google Drive, Microsoft OneDrive, Dropbox, etc.). Any sensitive data or information should be encrypted on physical drives. Should a computer crash occur, inform the instructor immediately to ensure that the appropriate provisions can be made.

Statement of Academic Integrity

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, this instructor will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code. Should students have any questions about plagiarism, research citations, cheating, or any other activity that may be interpreted as an attempt at academic dishonesty, please see the instructor before the assignment is due to discuss the matter.

For this class, the video quizzes, discussion questions, exams, and certain homework assignments are to be completed on an individual basis. Alternatively, collaboration and group work is encouraged for many of the homework assignments. An online forum will be established to help facilitate this collaboration. All assignments, quizzes, exams, etc. are considered open book/resource.

Prospective Video Lecture List

Module 1: Course Introduction & Environmental Law

V1: Course Introduction
V2: Module Introduction
V3: Contributions of the Mining Industry/Perspectives
V4: Stakeholders 1
V5: Stakeholders 2
V6: Environmental Ethics
V7: Introduction to Environmental Law
V8: Environmental Liability
V9: Federal/Administrative Regulation
V10: NEPA
V11: CAA
V12: CWA
V13: CERCLA
V14: RCRA
V15: Public Land Laws
V16: SMCRA

Module 2: Permitting & Environmental Material Balances

V17: Module Introduction
V18: Introduction to Permitting/Strategy
V19: EIS
V20: Acid Rock Drainage
V21: Metal Contamination of Water
V22: Sedimentation of Surface Water
V23: Cyanide
V24: Air Emissions
V25: Structural Impacts
V26: Material Balance Introduction and Approach
V27: Non-reacting Example 1
V28: Non-reacting Example 2
V29: Reactor Types
V30: Reacting Example 1
V31: Reacting Example 2
V32: Network Example
V33: Energy Balances

Module 3: Soil Engineering & Land Pollution Control

V34: Module Introduction
V35: Soil Ecology 1
V36: Soil Ecology 2
V37: Soil Physiology Classifications 1
V38: Soil Physiology Classifications 2
V39: Soil Mechanical Properties
V40: Soil Permeability
V41: Soil Water Erosion
V42: Soil Wind Erosion
V43: Soil Loss Calculations
V44: Soil Erosion Control Practices

Module 4: Hydrology & Fine Waste Disposal

V45: Module Introduction
V46: Precipitation Basics
V47: Surface Water vs. Subsurface Water
V48: Introduction to Hydrographs
V49: Hydrograph Calculations 1 (separation)
V50: Hydrograph Calculations 2 (peak flow rate)
V51: Hydrograph Calculations 3 (unit hydrograph)
V52: Hydrograph Calculations 4 (synthesis)
V53: Hydrograph Calculations 5 (summary)
V54: Fine Waste Disposal Methods
V55: Embankment Stability
V56: Impoundment Surface Flows.
V57: Impoundment Seepage
V58: Impoundment Flow Nets 1
V59: Impoundment Flow Nets 2
V60: Impoundment Volumetric Accounting
V61: Embankment Design
V62: Embankment Construction

Module 5: Water Quality Monitoring & Control

V63: Module Introduction
V64: General Chemistry Review
V65: Solution Chemistry
V66: Solid Solubility
V67: Phase Diagrams
V68: Suspension Stability
V69: Control Strategies
V70: Acid Rock Drainage Introduction
V71: Acid Rock Drainage Mitigation
V72: Acid Rock Drainage Cost Estimation
V73: Environmental Management Systems