

# Underground Mining Systems (MINE 205)

A Required Course for B.S. Degree in Mining Engineering

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## Course description:

Underground mining methods and equipment for bedded deposits and ore bodies; description and selection of mining methods, equipment requirements and selection, equipment design, and operational analysis.

## Instructor:

**Yi Luo**, Ph.D., P.E. Associate Professor  
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Lecture Hours: MRB 109, Tue, Thu 4:00 - 5:20 pm

Office Hours: Open door policy

## Prerequisite:

Geol 101 – knowledge of basic geological features, terms and definitions

## Text Book:

- Hartman, H.L. and J.M. Mutmansky, 2002, *Introductory Mining Engineering*, 2<sup>nd</sup> Edition, John Wiley & Sons, New York, 570 pp.
- Lecture notes and computer programs provided at my [Google Site - Underground Mining System](#). An invitation email from [noreply@googlegroups.com](mailto:noreply@googlegroups.com) will be sent to you. Please accept this invitation so that you can access this site

## References:

- SME, 1992, *SME Mining Engineering Handbook*, 2<sup>nd</sup> Edition, Vols. 1 &2, Ed. H.L. Hartman, Littleton, CO., 2260 pp. (check SME website <http://www.smenet.org/store/> for student discount on this book)
- Hustrulid, W.A. and R.L. Bullock, 2001, *Underground Mining Methods – Engineering Fundamental and International Case Studies*, SME 718 pp.

## Objectives:

Prepare students in the following areas of fundamental mining engineering

- Introduction of major tasks, components and methods in developing and operating underground mines (coal, metal and non-metal)
- Introduction of the scientific concepts, considerations and procedures in major design tasks
- Applications of mathematical, computer skills in the computations, data handling, engineering designs involved in planning, design and operating underground mines.

## Topics Covered

1. Introduction of the four stages of mining: objectives and major tasks
2. Prospecting: Objectives and methods

3. Exploration
  - Objectives, field works
  - Reserve estimate, feasibility study, decision making
4. Mine Development
  - Objectives, Major tasks involved
  - Planning & Design tasks and considerations
  - Ground control: pillar design and roof bolting
  - Mine Ventilation
  - Mine Drainage
  - Underground transportation systems, belt conveyor design
  - Manpower planning
  - Project scheduling
  - Unit operation: Rock breakage: Penetration and fragmentation, explosive, underground blasting pattern design
5. Exploitation
  - Objectives, underground mining methods and classifications
  - Unsupported Methods: Room and Pillar Mining Method
  - Unsupported Methods: Stope and Pillar, Shrinkage Stopping
  - Unsupported Methods: Sublevel stoping
  - Supported Mining Methods: Cut and fill, Stull stoping, Square set stoping
  - Caving Methods: Longwall Mining Method
  - Caving Methods: Longwall Mining Method, concerns and issues
  - Caving Methods: Shortwall Mining, Sublevel Caving, Block Caving, Problems with caving method, Post mining activities

**Learning Assessment:**

- 10 quizzes
- Five homework assignments on the subjects of major design tasks
- Two examinations

**Grading:**

- 10 Quizzes: 5%
- Five Homework Assignments: 55% (11% each)
- Two Exams: 40% (20% each)
- Attendance: ±5%

**Course Contribution to Mining Engineering Component:**

As one of the first mining engineering courses, this course begins with introduction of the four stages involved in a mining adventure and an overall view of underground mines. The emphases are placed on the mine development and exploitation. The major components, tasks, issues, considerations and methods for developing and operating underground mines are discussed. Fundamentals, solution techniques and computer applications in designing various underground mine components are taught. A number of computer programs developed by the instructor for designing mine components are provided to the students in electronic forms. This course covers many of mining engineering components that will not be covered in the later mining engineering courses.

**Course Relationship to Mining Engineering Program Outcomes:**

Through class discussions, material provided and homework problems, this course directly contributes to the mining engineering program outcomes a, b, c, h, I, j, k, l. Most importantly, the

students are exposed to the scientific concepts, problem formulation approaches, mathematical tools, solution techniques and applicable computer software involved in designing many components of the underground mining systems.

## **Others**

### **Academic Honesty**

Students are encouraged to discuss class topics and analyze problems among themselves. However, copying assignment solutions or written reports (or parts of) is strictly forbidden. Also, while the Internet could be used as a research tool, copying materials verbatim from the Internet is plagiarism, and will not be tolerated in this class. Please, be aware that your submitted materials may be compared with each other, or with materials from the Internet during the evaluation.

### **Social Justice Statement**

West Virginia University is committed to social justice. I concur with that commitment and expect to foster a nurturing learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestion as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with Disability Services (293-6700).

Prepared by: Yi Luo  
Revised Date: 8/18/2014