

# MINING ENGINEERING (MIN)

## College of Engineering and Mines

Department of Mining and Geological Engineering (<https://cem.uaf.edu/mingeo/>)  
907-474-7388

### MIN F101 Minerals, Man and the Environment

3 Credits

Offered As Demand Warrants

A general survey of the impact of the mineral industries on man's economic, political and environmental systems.

**Lecture + Lab + Other:** 3 + 0 + 0

### MIN F103 Introduction to Mining Engineering

1 Credit

Offered Fall

Concepts and methods utilized in mining engineering and mining unit operations.

**Lecture + Lab + Other:** 1 + 0 + 0

### MIN F104 Mining Safety and Operations Laboratory

1 Credit

Offered Fall

Practical training at the Silver Fox Mine in mining operations and safety. Course complies with Mine Safety and Health Administration (MSHA) 40 hour new miner training.

**Lecture + Lab + Other:** 0 + 3 + 0

### MIN F110 Elements of Mine Safety, Operations and Development

2 Credits

Offered Fall and Spring

Introduction to pre-mining activities, mine unit operations and mine safety. Basics of mine development; access to mining property, haul roads, ore body, shaft, slope and ramp locations; frozen ground environments and run-off water. Underground and surface mining hazards, safe practices, and engineered controls.

**Recommended:** MATH F151X, MATH F152X.

**Lecture + Lab + Other:** 2 + 0 + 0

### MIN F202 Surveying and CAD for Engineers

2 Credits

Offered Fall

Surveying principles for surface and underground properties. Field and office procedures for preparation of maps and engineering data. Introduction to engineering CAD software.

**Prerequisites:** MATH F151X, MATH F152X.

**Lecture + Lab + Other:** 1 + 3 + 0

### MIN F225 Quantitative Methods in Mining Engineering

2 Credits

Offered Fall

Introduction to ore reserve estimation, classical estimation methods and techniques, error in estimations and pitfalls, introduction to classical statistics, introduction to geostatistics, ordinary kriging, block kriging, modeling the sample variogram, co-kriging and global estimation.

**Prerequisites:** MATH F251X.

**Lecture + Lab + Other:** 2 + 0 + 0

### MIN F226 Mine Development

2 Credits

Offered Spring

Review of pre-mining activities. Access to mining property, haul road location and design. Access to ore body; shaft, slope and ramp locations; shape, sizing and development. Development of access in frozen ground environments. Layout of development mains, cross-cuts, raises and winzes for ventilation, transport and optimum extraction of ore body.

**Prerequisites:** MIN F103; MIN F225.

**Recommended:** MATH F251X.

**Lecture + Lab + Other:** 2 + 0 + 0

### MIN F301 Mine Plant Design

3 Credits

Offered Spring

Quantitative study and design of various systems and equipment used in haulage, hoisting, drainage, pumping and power (compressed air and electricity). Importance of the natural conditions and production level in the equipment selection procedure emphasized.

**Prerequisites:** ES F208 and ES F307.

**Recommended:** ES F341.

**Lecture + Lab + Other:** 3 + 0 + 0

### MIN F302 Underground Mine Environmental Engineering

3 Credits

Offered Spring

Analysis of underground mine ventilation systems, ventilation requirements and system structure, ventilation planning, design and engineering control, mine ventilation network, gas and dust explosion, rescue and recovery.

**Prerequisites:** MIN F110; ES F341.

**Lecture + Lab + Other:** 2 + 3 + 0

### MIN F303 Ore Handling and Industrial Explosives

3 Credits

Offered Spring

Quantitative study and design of various systems and equipment used in haulage, hoisting, drainage, pumping and power (compressed air and electricity). Types and properties of industrial explosives; systems of initiation; theories of blasting; designs of open pit bench blasting; designs of underground blasting/rounds; and applications in mining.

**Prerequisites:** ES F208; ES F307; MIN F370 (may be taken concurrently).

**Recommended:** ES F341.

**Lecture + Lab + Other:** 3 + 0 + 0

### MIN F313 Introduction to Mineral Preparation

3 Credits

Offered Fall Odd-numbered Years

Elementary theory and principles of unit processes of liberation, concentration and solid-fluid separation as applied to mineral beneficiations.

**Prerequisites:** Junior standing.

**Lecture + Lab + Other:** 2 + 3 + 0

### MIN F370 Rock Mechanics

3 Credits

Offered Spring

Physical and mechanical properties of rock; rock mass classification systems; stress distribution in the vicinity of mining openings, design criteria and support for structures in rock mass, instrumentation and monitoring of opening's stability as well as strata control and surface subsidence.

**Prerequisites:** ES F331; may be taken concurrently.

**Lecture + Lab + Other:** 2 + 3 + 0

**MIN F380 Computer Aided Orebody Modeling**

1 Credit

Offered As Demand Warrants

Develops an orebody model from drill hole data in a computer-aided design environment. The data is converted into a drill hole database, following which, a 3D visual model is developed. Basic tools covered include concepts of computer-aided design, database error checking and triangulation.

**Prerequisites:** GEOS F332.**Lecture + Lab + Other:** 2 + 3 + 0**MIN F390 Geostatistics and Mineral Economics**

3 Credits

Offered Fall

Introduction to ore reserve estimation, classical estimation methods and techniques, error in estimations and pitfalls, introduction to classical statistics, introduction to geostatistics, ordinary kriging, block kriging, modeling the sample variogram, co-kriging and global estimation. Introduction to engineering economics, ore sampling and reserve calculations, and mine feasibility studies.

**Prerequisites:** COJO F131X or COJO F141X; MATH F251X; GE F261.**Lecture + Lab + Other:** 3 + 0 + 0**MIN F401 Mine Site Field Trips**

1 Credit

Offered As Demand Warrants

Field trips to active surface and underground mines to gain perceptual knowledge of modern mining systems by observation. Includes a systematic summarization and analysis of the mine after each visit to gain an in-depth understanding of mining engineering principles.

**Prerequisites:** MIN F202; MIN F301; MIN F302; MIN F370.**Lecture + Lab + Other:** 0.5 + 3 + 0**MIN F407 Mine Reclamation and Environmental Management**

2 Credits

Offered Fall Even-numbered Years

Principles and practices of mine reclamation and waste disposal. Pre-mining assessments and plans. Design of settling and tailings ponds and waste impoundments. Stream bed restoration and revegetation.

**Prerequisites:** CHEM F106X; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X.**Recommended:** ES F341.**Lecture + Lab + Other:** 2 + 0 + 0**MIN F408 Mineral Valuation and Economics**

3 Credits

Offered Spring

Introduction to engineering economics, ore sampling and reserve calculations, and mine feasibility studies.

**Prerequisites:** COJO F131X or COJO F141X; GE F375 or MIN F301.**Lecture + Lab + Other:** 3 + 0 + 0**MIN F409 Operations Research and Computer Applications in Mineral Industry**

2 Credits

Offered Spring

Fundamental concepts of probability and statistics and the use of operations research and computer techniques for understanding, analysis, forecasting and optimization of mining operations and systems.

**Prerequisites:** MIN F390; MIN F454.**Lecture + Lab + Other:** 2 + 0 + 0**MIN F415 Coal Preparation**

3 Credits

Offered As Demand Warrants

Unit operations, flowsheets, washability characteristics and control by sink-float methods for coal preparation plants. Market requirements and economics of preparation.

**Prerequisites:** MIN F313 or graduate standing.**Lecture + Lab + Other:** 2 + 3 + 0**MIN F443 Principles and Applications of Industrial Explosives**

3 Credits

Offered Fall

Types and properties of industrial explosives; systems of initiation; theories of blasting; designs of open pit bench blasting; designs of underground blasting/rounds; applications in mining, civil construction and other fields; blasting vibration, structural damage and their control; overbreak control; safe practices; safety regulations; blast hole drilling and drilling equipment.

**Prerequisites:** MIN F370.**Lecture + Lab + Other:** 3 + 0 + 0**MIN F444 Accidents, Emergency and Safety Management in Mines**

2 Credits

Offered Spring

Accident statistics, accident investigation and prevention, major provisions of current laws, rule-making procedures, mine fires and explosions, causes and prevention, loss control principles and methods, emergency evacuation, emergency response and emergency preparedness, safety management systems and behavioral science applications.

**Prerequisites:** MIN F302; MIN F482.**Lecture + Lab + Other:** 2 + 0 + 0**MIN F454 Underground Mining Methods**

2 Credits

Offered Fall

Underground mining methods for coal and non-coal deposits. Includes design parameters, selection of mining methods, mine planning process, auxiliary operations and various underground mining methods.

**Prerequisites:** MIN F302; MIN F370; MIN F482.**Lecture + Lab + Other:** 2 + 0 + 0**MIN F482 Computer-aided Mine Design:VULCAN**

3 Credits

Offered Fall

Familiarization with VULCAN mine design software to store, manage, model and display exploration data. Estimate volume, tonnage and quality of reserve, design declines and development drives in underground and surface coal and hardrock mines, design underground and surface coal mine plans and design of underground stopes, perform underground and surface grade control.

**Prerequisites:** Junior, senior or graduate standing in Mining Engineering, Geological Engineering.**Stacked with** MIN F682.**Lecture + Lab + Other:** 2 + 3 + 0**MIN F484 Surface Mining Methods**

1 Credit

Offered Spring

Modern methods of surface mine design. Strip and open pit optimization techniques. Production planning and scheduling. Use of mine design software.

**Prerequisites:** MIN F110; MIN F390; MIN F482; Junior or senior standing in mining engineering.**Lecture + Lab + Other:** 1 + 0 + 0

**MIN F485 Mining Engineering Exit Interview**

0 Credit

Offered Spring

An Exit interview will be conducted to obtain feedback on the program.

**Prerequisites:** Senior standing in mining engineering.**Corequisites:** MIN F490.**Lecture + Lab + Other:** 0 + 0 + 0**MIN F489 Mining Design Project I**

1 Credit

Offered Fall

This course is a precursor to MIN F490. The student is expected to meet with the instructor to finalize the senior design project topic, lay out a project plan, gather data and prepare (such as formatting electronic data) as necessary for the successful execution of the project in MIN F490.

**Prerequisites:** WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X, WRTG F214X; MIN F303; MIN F370.**Lecture + Lab + Other:** 1 + 0 + 0**MIN F490 Mining Design Project II**

2 Credits

Offered Spring

Design of mine layout including extraction and beneficiation, and economic evaluation of a mining project. A comprehensive written report of the design and analysis is required.

**Prerequisites:** MIN F454; MIN F489.**Lecture + Lab + Other:** 1 + 4 + 0**MIN F491 Automation and Control**

2 Credits

Offered Spring

Automation practices for controlling equipment and operations. Use of various control devices, such as sensors, transducers, motor starters, variable-frequency motor drives, and proportional hydraulic valves. Ladder logic programming of programmable automation controllers (PACs) and human-machine interface (HMI) touch-screen panels.

**Prerequisites:** ES F307; Junior standing or senior standing in Mining, Geological, Civil, Mechanical, Petroleum, Electrical Engineering.**Lecture + Lab + Other:** 1 + 3 + 0**MIN F601 Application of Artificial Neural Networks**

3 Credits

Offered As Demand Warrants

Basic neural network architectures, including rules, training methods and practical applications. Training and application issues typical of earth sciences problems. Some topics require mathematical analysis. Genetic algorithms and use of network ensembles will be briefly presented.

**Prerequisites:** Graduate standing in engineering; programming ability; knowledge of MATLAB, a plus.**Recommended:** MATH F253X, MATH F314; MIN F408; MIN F635.**Lecture + Lab + Other:** 3 + 0 + 0**MIN F621 Advanced Mineral Economics**

3 Credits

Offered As Demand Warrants

Introduction to options valuation of mineral projects; uncertainty and risk in mineral valuations; stochastic price models; dynamic programming and investment analysis; real options techniques.

**Prerequisites:** Admission by arrangement.**Lecture + Lab + Other:** 3 + 0 + 0**MIN F631 Research Methods in Mineral Engineering**

4 Credits

Offered As Demand Warrants

Research methods including problem definition and statement, designing experiments, collecting and interpreting data. Methods of theoretical and experimental analysis will be reviewed and examples given.

**Prerequisites:** Graduate standing.**Lecture + Lab + Other:** 3 + 3 + 0**MIN F635 Advanced Geostatistical Applications**

3 Credits

Offered As Demand Warrants

Introduction to the theory and application of geostatistics. Review of classical statistics, continuous and discrete distributions, hypothesis testing and global estimation. Presentation of fundamental geostatistical concepts including: variogram, estimation variance, block variance, kriging, geostatistical simulation. Emphasis on the practical application of geostatistical techniques.

**Prerequisites:** MIN F408; graduate standing.**Cross-listed with** GE F635.**Lecture + Lab + Other:** 2 + 3 + 0**MIN F637 Mine Systems Simulation**

3 Credits

Offered As Demand Warrants

Application of computer simulation to the analysis of static and dynamic mine systems and the development of useful programs for mine operators. Design of simulation experiments in mining engineering.

**Prerequisites:** MIN F409; graduate standing.**Lecture + Lab + Other:** 2 + 3 + 0**MIN F652 Numerical Methods in Mine Ventilation**

3 Credits

Offered As Demand Warrants

Differencing schemes for the partial differential equations of flow in mine networks, typical boundary conditions for mine ventilation systems, computer-aided solution techniques. Application to flow of fluids through porous media is covered.

**Prerequisites:** MIN F302; graduate standing.**Lecture + Lab + Other:** 2 + 3 + 0**MIN F673 Advanced Rock Mechanics**

3 Credits

Offered As Demand Warrants

The study of theoretical and experimental methods in rock mechanics. State of stress and potential failure zone around two- and three-dimensional structures in rock based on theoretical, numerical and experimental techniques and failure criteria are presented.

**Prerequisites:** MIN F370; graduate standing.**Lecture + Lab + Other:** 2 + 3 + 0**MIN F674 Advanced Ground Control**

3 Credits

Offered As Demand Warrants

A study of current rock mechanic problems related to advances in mining and construction technologies. Particular emphasis on the importance of rock and frozen ground properties and stress evaluation in designing and monitoring stability of structures for gas, oil and radioactive materials storage, geothermal energy recovery, solution mining, and those

**Prerequisites:** MIN F370.**Lecture + Lab + Other:** 0 + 0 + 0

**MIN F682 Computer-aided Mine Design:VULCAN**

3 Credits

Offered Fall

Familiarization with VULCAN mine design software to store, manage, model and display exploration data. Estimate volume, tonnage and quality of reserve, design declines and development drives in underground and surface coal and hardrock mines, design underground and surface coal mine plans and design of underground stopes, perform underground and surface grade control.

**Prerequisites:** Graduate standing in Mining Engineering or Geological Engineering.

**Stacked with** MIN F482.

**Lecture + Lab + Other:** 2 + 3 + 0

**MIN F688 Graduate Seminar I**

1 Credit

Offered As Demand Warrants

Preparation and presentation of research outlines by graduate students and participation in regularly organized mineral engineering department seminars.

**Prerequisites:** Admission to graduate program.

**Cross-listed with** MPR F688.

**Lecture + Lab + Other:** 1 + 0 + 0

**MIN F698 Non-thesis Research/Project**

1-9 Credits

**Lecture + Lab + Other:** 0 + 0 + 0

**MIN F699 Thesis**

1-9 Credits

**Lecture + Lab + Other:** 0 + 0 + 0