## MINING ENGINEERING (MIN)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Offered</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>MIN F101</td>
<td>Minerals, Man and the Environment</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>A general survey of the impact of the mineral industries on man's economic, political and environmental systems.</td>
</tr>
<tr>
<td>MIN F103</td>
<td>Introduction to Mining Engineering</td>
<td>1</td>
<td>Fall</td>
<td>Concepts and methods utilized in mining engineering and mining unit operations.</td>
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<tr>
<td>MIN F104</td>
<td>Mining Safety and Operations Laboratory</td>
<td>1</td>
<td>Fall</td>
<td>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.</td>
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<tr>
<td>MIN F202</td>
<td>Mine Surveying</td>
<td>3</td>
<td>Fall</td>
<td>Surveying principles for surface and underground control of mining properties. Field and office procedures for preparation of maps and engineering data.</td>
</tr>
<tr>
<td>MIN F225</td>
<td>Quantitative Methods in Mining Engineering</td>
<td>2</td>
<td>Fall</td>
<td>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.</td>
</tr>
<tr>
<td>MIN F226</td>
<td>Mine Development</td>
<td>2</td>
<td>Fall</td>
<td>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. Level intervals, size and location of ore passes, design and optimization.</td>
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<tr>
<td>MIN F301</td>
<td>Mine Plant Design</td>
<td>3</td>
<td>Spring</td>
<td>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.</td>
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<tr>
<td>MIN F302</td>
<td>Underground Mine Environmental Engineering</td>
<td>3</td>
<td>Spring</td>
<td>Analysis of underground mine ventilation systems, ventilation planning, design and engineering control, mine ventilation network.</td>
</tr>
<tr>
<td>MIN F313</td>
<td>Introduction to Mineral Preparation</td>
<td>3</td>
<td>Fall Odd-numbered Years</td>
<td>Elementary theory and principles of unit processes of liberation, concentration and solid-fluid separation as applied to mineral beneficiations.</td>
</tr>
<tr>
<td>MIN F370</td>
<td>Rock Mechanics</td>
<td>3</td>
<td>Spring</td>
<td>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.</td>
</tr>
<tr>
<td>MIN F380</td>
<td>Computer Aided Orebody Modeling</td>
<td>1</td>
<td>As Demand Warrants</td>
<td>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.</td>
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<tr>
<td>MIN F401</td>
<td>Mine Site Field Trips</td>
<td>1</td>
<td>Field Warrants</td>
<td>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.</td>
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</tbody>
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MIN F407  Mine Reclamation and Environmental Management  (W)
3 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 
other 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: 3 + 0 + 0

MIN F408  Mineral Valuation and Economics  (O)
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
3 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 F225; MIN F454.
Lecture + Lab + Other: 3 + 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; 
thories 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
3 Credits
Offered As Demand Warrants
Accident statistics, accident investigation and prevention, major 
provisions of current laws, rule-making procedures, mine fires and 
exposions, 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.
Corequisites: MIN F454.
Lecture + Lab + Other: 3 + 0 + 0

MIN F454  Underground Mining Methods
3 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 F301; MIN F302; MIN F370.
Lecture + Lab + Other: 3 + 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
2 Credits
Offered Spring Even-numbered Years
Modern methods of surface mine design. Strip and open pit optimization 
techniques. Production planning and scheduling. Use of mine design 
software.
Prerequisites: MIN F225; MIN F226; Junior or senior standing in mining 
ingineering.
Lecture + Lab + Other: 2 + 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 pre-cursor 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 as necessary for the successful 
execution of the project in MIN F490.
Prerequisites: WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or 
WRTG F214X; MIN F301; MIN F302; MIN F370.
Special Notes: Both MIN F489 and MIN F490 must be completed to fulfill 
the writing intensive requirement.
Lecture + Lab + Other: 1 + 0 + 0

MIN F490  Mining Design Project II  (W)
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: WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or 
WRTG F214X; MIN F301; MIN F302; MIN F370; MIN F454; MIN F489.
Special Notes: Both MIN F489 and MIN F490 must be completed to fulfill 
the writing intensive requirement.
Lecture + Lab + Other: 1 + 4 + 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  Geostatistical Ore Reserve Estimation  
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 exposed  
to rock outbursts and earthquakes. Rock and frozen ground properties  
related to other dynamic loading conditions, such as in blasting, are also  
discussed.  
**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.  
**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