MINING ENGINEERING (MIN)

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 F202  Mine Surveying
3 Credits
Offered Fall
Surveying principles for surface and underground control of mining properties. Field and office procedures for preparation of maps and engineering data.
Prerequisites: MATH F151X, MATH F152X.
Lecture + Lab + Other: 2 + 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. Level intervals, size and location of ore passes, design and optimization.
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 Fall
Analysis of underground mine ventilation systems, ventilation planning, design and engineering control, mine ventilation network.
Prerequisites: MIN F103; MIN F226; ES F341.
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.
Corequisites: ES F331.
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 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 in-depth understanding of mining engineering principles.
Prerequisites: MIN F202; MIN F301; MIN F302; MIN F370.
Lecture + Lab + Other: 0.5 + 3 + 0
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Offered At</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>MIN F407</td>
<td>Mine Reclamation and Environmental Management (W)</td>
<td>3</td>
<td>Offered Fall Even-numbered Years</td>
<td>Corequisites: CHEM F106X; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X.</td>
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<td>Recommended: ES F341.</td>
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<td>MIN F408</td>
<td>Mineral Valuation and Economics (O)</td>
<td>3</td>
<td>Offered Spring</td>
<td>Corequisites: ES F341.</td>
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<tr>
<td>MIN F409</td>
<td>Operations Research and Computer Applications in Mineral Industry</td>
<td>3</td>
<td>Offered Spring</td>
<td>Corequisites: MIN F225; MIN F454.</td>
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<tr>
<td>MIN F415</td>
<td>Coal Preparation</td>
<td>3</td>
<td>Offered As Demand Warrants</td>
<td>Corequisites: MIN F313 or graduate standing.</td>
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<tr>
<td>MIN F433</td>
<td>Principles and Applications of Industrial Explosives</td>
<td>3</td>
<td>Offered Fall</td>
<td>Corequisites: MIN F370.</td>
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<tr>
<td>MIN F444</td>
<td>Accidents, Emergency and Safety Management in Mines</td>
<td>3</td>
<td>Offered As Demand Warrants</td>
<td>Corequisites: MIN F302.</td>
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<td>Special Notes: Both MIN F489 and MIN F490 must be completed to fulfill</td>
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<td>the writing intensive requirement.</td>
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<tr>
<td>MIN F454</td>
<td>Underground Mining Methods</td>
<td>3</td>
<td>Offered Fall</td>
<td>Corequisites: MIN F301; MIN F302; MIN F370.</td>
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<tr>
<td>MIN F482</td>
<td>Computer-aided Mine Design:VULCAN</td>
<td>3</td>
<td>Offered Fall</td>
<td>Corequisites: Senior standing in mining engineering.</td>
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<td>MIN F484</td>
<td>Surface Mining Methods</td>
<td>2</td>
<td>Offered Spring Even-numbered Years</td>
<td>Corequisites: MIN F225; MIN F226; Junior or senior standing in mining</td>
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<td>MIN F485</td>
<td>Mining Engineering Exit Interview</td>
<td>0</td>
<td>Offered Spring</td>
<td>Corequisites: MIN F490.</td>
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<td>MIN F489</td>
<td>Mining Design Project I</td>
<td>1</td>
<td>Offered Fall</td>
<td>Corequisites: MIN F489.</td>
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<tr>
<td>MIN F490</td>
<td>Mining Design Project II</td>
<td>2</td>
<td>Offered Spring</td>
<td>Corequisites: MIN F489.</td>
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### Corequisites
- CHEM F106X; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X.
- WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X; MIN F301; MIN F302; MIN F370.
- MIN F301; MIN F302; MIN F370; MIN F454; MIN F489.
- MIN F489.
- MIN F490.
- MIN F482.
- MIN F484.

### Special Notes
- Both MIN F489 and MIN F490 must be completed to fulfill the writing intensive requirement.
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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.
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
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 F698.
Lecture + Lab + Other: 0 + 0 + 0

MIN F699  Thesis
1-9 Credits
Offered As Demand Warrants
Lecture + Lab + Other: 0 + 0 + 0