



THE UNIVERSITY OF UTAH

*Undergraduate Program Guide*

# *Mining Engineering*



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The curriculum in mining engineering is accredited by the Accreditation Board of Engineering and Technology (ABET).  
The University of Utah is accredited by the Northwest Association of Schools and Colleges.

## Table of Contents

|  |    |
|--|----|
| Introduction.....  | 3  |
| Brief Overview of Mining Engineering.....                              | 3  |
| Admission Policy.....  | 3  |
| Career Opportunities.....  | 3  |
| Facilities.....  | 4  |
| Curriculum.....  | 5  |
| Technical Electives.....   | 5  |
| Accreditation.....   | 5  |
| Requirement Checklist for Students Majoring in Mining Engineering..... | 7  |
| Model Program of Study.....  | 9  |
| Undergraduate Mining Engineering Course Descriptions.....              | 10 |
| Course Schedules and Registration Information.....                     | 11 |
| Transfer Credit.....   | 14 |
| AP Credit.....   | 14 |
| CLEP Credit.....   | 14 |
| Minor Courses of Study.....  | 15 |
| Financial Aid and Scholarship Information.....                         | 15 |
| Related Professional Societies with Student Membership.....            | 19 |



## Introduction

This guide is intended to help students understand the undergraduate program in Mining Engineering at the University of Utah. It is intended as a supplement to the University of Utah's General Catalog or Bulletin, which remains the official document of the required program leading to a Bachelor of Science degree in Mining Engineering.

## Brief Overview of Mining Engineering

Mining is the discovery, evaluation, development, operation, and reclamation of mineral deposits that are underground, near the surface, and in bodies of water and associated sediments. Mining engineers design, develop, reclaim, and manage mines that are profitable, safe, and environmentally acceptable.

A successful career in mining engineering requires a strong background in mathematics, computer applications, economics, communication skills, and the physical sciences, particularly geology, physics, and chemistry. In addition, mining engineers must be versed in rock mechanics, mining methods, mineral beneficiation, mine ventilation, surveying, mineral evaluation, health and safety issues, permitting, environmental protection, reclamation, and management.

Instruction in Mining and Metallurgy was first given at the University of Utah in 1891. A School of Mines was formally established at the University of Utah in 1901 by an Act of the Utah State Legislature. In 1948, it was designated the State College of Mines and Mineral Industries, and in 1988 the name was changed to the **College of Mines and Earth Sciences**. The campus is located near significant coal, base metal, precious metal, and nonmetallic deposits, offering opportunities for on-site visits and practical instruction.

## Admission Policy

Anyone admitted to the University of Utah may declare mining engineering as a major. High school students planning to seek a degree in mining engineering should complete as many courses as possible in mathematics, English, physics, chemistry, and mechanical drawing or computer-aided drafting (CAD). Entering freshmen normally begin their first year with calculus and chemistry. Deviation from this pattern usually increases the time required to complete the suggested four-year program. See "Model Program of Study" on page 8 of this guide for more information.

## Career Opportunities

A Bachelor of Science (BS) degree in mining engineering provides students with a versatile education that opens diverse professional opportunities. Mining engineers design, develop, and manage systems for obtaining useful minerals from the earth. Successful completion of the undergraduate mining engineering curriculum qualifies the student for a professional career in valuation and development of mineral properties, design and management of mine systems, or research and consulting. Research and instruction facilities at the University of Utah include laboratories for rock mechanics, ventilation, mine aerosols, mine reclamation, mine water, explosives, and computer applications. Graduates have a range of job options in the mining industry, such as engineering, operations, sales, and management. The breadth of subjects covered in the mining curriculum provides additional opportunities in related fields. Private sector businesses, as well as state and federal agencies rely on the services of mining engineers. Starting salaries are among the highest in the engineering profession. Like their predecessors, today's trained mining engineers are limited only by their own imaginations and resourcefulness.



## Facilities

Laboratories and equipment for the Mining Engineering program include the following:

- **Computer labs**, which house personal computers and workstations connected to Department, College, and University networks.
- **Ventilation equipment**, including apparatus for measuring air quality, flow, and contaminants. Also available are fans, ducts, and a gallery simulating full-scale mine openings.
- **Reclamation equipment**, including instruments for field analysis of water quality, stream velocity measurements, and sample retrieval. Also available are ICP and AA instruments for measurements of minute amounts of metal contaminants, equipment for flocculation experiments, and equipment for culturing and identification of microbial species.
- **Mine aerosol equipment**, used for sampling and characterizing mine dust and other airborne particulate matter.
- **Permeability apparatus**, a pressure chamber and data collection system for measuring permeability of rock cores up to six inches in diameter.
- **Rock Mechanics Lab** in the Ivor Thomas Building, with three testing machines for measuring strength and mechanical properties of rock. Equipment is also available for applying sample confinement and pore pressure during testing; measuring shear strength and permeability of soils and soil-like materials; measuring permeability of joined rock; and taking field measurements of deformation and elastic properties of geologic materials.
- **Mine Systems Research Lab**, including two high-head bays for experimentation and a machine shop for fabrication and maintenance of research equipment.
- **IRECO Fragmentation Lab**, which houses a detonation chamber with several high-speed cameras, a darkroom, photographic equipment, and high-speed data acquisition capability. It also includes field equipment for measuring environmental effects of blasting and down-hole detonation velocity.



Students prepare a rock sample for testing in the Rock Mechanics Lab.

### **Majoring in Mining Engineering**

The University of Utah has established mandatory advising meetings during the freshmen and sophomore years. Outside of this we strongly recommend that students meet annually with the academic advisor and faculty mentor to make sure they are sequencing their coursework correctly and taking advantage of any internship or professional development opportunities that are available. Contact information is listed below.

#### **Academic Advisor**

Pam Hofmann      [pam.hofmann@utah.edu](mailto:pam.hofmann@utah.edu)      801-585-5176      313WBB

#### **Faculty Mentors**

|               |                          |  |              |
|---------------|--------------------------|--|--------------|
| Last Name A-E | Professor Jeff Johnson   | <a href="mailto:Jeffreycraig.johnson@utah.edu">Jeffreycraig.johnson@utah.edu</a> | 801-585-1553 |
| Last Name F-N | Professor Pratt Rogers   | <a href="mailto:pratt.rogers@utah.edu">pratt.rogers@utah.edu</a>                 | 801-585-3360 |
| Last Name O-Z | Professor Jessica Wempen | <a href="mailto:j.wempen@utah.edu">j.wempen@utah.edu</a>                         | 801-581-3029 |
| Senior Year   | Professor Mike Nelson    | <a href="mailto:mike.nelson@utah.edu">mike.nelson@utah.edu</a>                   | 801-595-5176 |

#### **Curriculum**

Undergraduate students take a core of courses in calculus, physics, general chemistry, engineering mathematics, statistics, statics, and strengths of materials, computer science, electrical and technical engineering fundamentals, and technical writing. In addition to these basic engineering courses, they take others in physical geology, structural geology, mineralogy, and exploration geology. Graduation requirements include passing the national Fundamentals of Engineering examination. Students must also meet the University of Utah general requirements. Advanced Placement (AP) and transfer credits may satisfy some of these requirements.

Specialized mining engineering courses include surveying, underground and surface mining methods, fluid mechanics, thermodynamics, engineering design, ventilation and air conditioning, rock mechanics, mineral evaluation, reclamation, and mine administration and finance. Students also select two technical electives from a variety of advanced courses and choose either an underground or surface mining assignment as the senior design project.

#### **Technical Electives**

Technical electives are generally advanced courses (5000 level or above) that will build a stronger technical background for the future engineer. The following is a list of a few pre-approved technical electives that may be useful:

- MG EN 5030 (2) – Materials Handling
- MG EN 5270 (2) – Landslides and Slope Stability
- MG EN 5290 (2) – Introduction to Finite Element Modeling in Geomechanics
- MG EN 5360 (2) – Risk Management
- MG EN 5550 (2) – Explosives and Rock Blasting
- MG EN 5970 (2) – Intern Program (see page 5)
- MG EN 5980 (1-3) – Special Topics
- GEO 5450 (3) – Ore Genesis and Mineral Exploration

Other courses may also be acceptable; please contact the departmental advisor for additional courses.

### Policy for Internship Technical Elective Credit\*

Students may earn two semester hours of technical elective credit for internship-related work experiences, provided that the following criteria are met:

1. A company engineer must mentor the student.
2. The student will work their Department Undergraduate Advisor who will supervise and grade their project.
3. The student must submit a proposal to the company mentor and faculty advisor
4. The student must be primarily involved in testing/data analysis, process improvement/development activities where the student has the opportunity to practice and develop engineering skills.
5. The company must send in writing: a) verification that the student was involved in appropriate engineering activities; b) confirmation that the student was mentored by an engineer; and c) a general evaluation of the student's performance.
6. The student will register for special topics credit during the fall following their summer internship.
7. The student must write and submit a final report (10 to 30 double-spaced pages in length, depending on desired credit) that includes
  - Literature survey of general project topics
  - Experimental information
  - Data presentation and analysis
  - Project(s) conclusions

(Students need to include some data they have acquired as well as an analysis of their data as it relates to their project. However, students should omit proprietary details. Terms like *process A* or *compound X* should be used to protect sensitive company information. The report should not be submitted to the department until the company has had the opportunity to review it.

8. The student may be required to make an oral presentation in addition to writing the report. \*\*

*\*Students must review the syllabus for this course with the department chair and receive a permission code before enrolling.*

*\*\*The course credit will be determined based upon the duration of the internship and the extent of the report. A final grade will be given based upon the final report and the company evaluation of the student's performance.*



Students Gain Practical Experience in Many Areas, Including Surveying

# Checklist of Departmental Requirements in Mining Engineering

| GROUP                                  | Requirement (course number and title or other description)   | Hrs    | Sem/Yr Complete | Grade |
|--|--|--------|-----------------|-------|
| MATH                                   | MATH 1210 Calculus I (QA)  | 4      |                 |       |
|  | MATH 1220 Calculus II  | 4      |                 |       |
|  | MATH 2210 Calculus III   | 3      |                 |       |
|  | MATH 2250 Ordinary Differential Equations and Linear Algebra                                       | 3      |                 |       |
|  | MET E 3070 Statistical Methods in Earth Sciences and Engineering or MATH 3070 Applied Statistics I | 3 or 4 |                 |       |
| 2.0 cum gpa                            |  |        |                 |       |
| SCIENCE<br>ENGINEERING<br>GEOLOGY      | CHEM 1210 General Chemistry I  | 4      |                 |       |
|  | CHEM 1215 General Chemistry Laboratory I   | 1      |                 |       |
|  | PHYCS 2210 Physics for Scientists and Engineers I  | 4      |                 |       |
|  | PHYCS 2220 Physics for Scientists and Engineers II   | 4      |                 |       |
|  | ECE 2200 Electrical Engineering  | 1.5    |                 |       |
|  | CVEEN 2010 Statics   | 3      |                 |       |
|  | ME EN 2300 or CH EN 2300 Thermodynamics  | 3      |                 |       |
|  | GEO 1110 Introduction to Earth Systems   | 3      |                 |       |
|  | GEO 1115 Laboratory for Introduction to Earth Systems  | 1      |                 |       |
|  | GEO 3060 Structural Geology and Tectonics  | 3      |                 |       |
| 2.0 cum gpa                            |  |        |                 |       |
| Group V<br>MINING<br>2.2 cum gpa       | MG EN 1050 Technical Communications  | 2      |                 |       |
|  | MG EN 2200 Utah Mining History (DV)  | 3      |                 |       |
|  | MG EN 2400 Introductory Surveying (QB)   | 3      |                 |       |
|  | MG EN 3010 Intro to Mining   | 3      |                 |       |
|  | MG EN 3015 Mine Visits (week before start of sophomore year)                                       | 1      |                 |       |
|  | MG EN 3400 Mine Surveying  | 1      |                 |       |
|  | MG EN 5010 Underground Mining Methods (QI)   | 3      |                 |       |
|  | MG EN 5020 Surface Mining Methods (QI)   | 3      |                 |       |
|  | MG EN 5040 Engineering Design  | 2      |                 |       |
|  | MG EN 5050 Mine Ventilation and Air Conditioning (QI)  | 3      |                 |       |
|  | MG EN 5080 Mine Permitting and Reclamation   | 2      |                 |       |
|  | MG EN 5090 Underground Mine Design or MG EN 5120 Surface Mine Design (CW)                          | 3      |                 |       |
|  | MG EN 5150 Mechanics of Materials  | 3      |                 |       |
|  | MG EN 5160 Rock Mechanics Applications   | 3      |                 |       |
|  | MG EN 5170 Mine Administration and Finance   | 2      |                 |       |
|  | MG EN 5320 Hydraulic Systems   | 3      |                 |       |
|  | MG EN 5340 Mineral Evaluation  | 3      |                 |       |
|  | MG EN 5350 Mine Safety and Health  | 4      |                 |       |
| Group VI - SEMINAR                     | MG EN 4990 Mining Seminar*   | 0.5    |                 |       |
| Group VII Tech Elective<br>2.2 cum gpa | Technical Elective**   | 2      |                 |       |
|  | Technical Elective**   | 2      |                 |       |
| Group VIII<br>Other Courses            | LEAP 1501  | 3      |                 |       |
|  | LEAP 1500  | 3      |                 |       |
|  | MET E 1610 Introduction to Extractive Metallurgy   | 2      |                 |       |

\*Students are required to take the Seminar **each semester**. Students who have completed 4 hours of Seminar credits are not required to register for the course, but are expected to attend. Exceptions for unavoidable schedule conflicts must be cleared with the Undergraduate Advisor.

\*\* Four hours of technical electives should be selected. These courses require a grade of C- or better.

Students must also complete the University of Utah General Education requirements (see pages 9 and 10 of this guide).

## PROGRAM OF STUDY FOR ENTERING FRESHMAN

| Freshman Year                           |             |   |             |
|---|-------------|---|-------------|
| Fall Semester                           |             | Spring Semester                           |             |
| Course                                  | Hours       | Course                                    | Hours       |
| CHEM 1210, 1215                         | 5           | WRTG 2010                                 | 3           |
| Math 1210 Calculus I                    | 4           | MATH 1220 Calculus II                     | 4           |
| LEAP 1501 Social Ethical Eng. - BF      | 3           | LEAP 1500 Eng. & Humanities - HFDV        | 3           |
| MG EN 1050 AutoCAD                      | 2           | GEO 1110, 1115 Intro to Earth Science     | 4           |
| MG EN 4990 Seminar                      | 0.5         | MG EN 4990 Seminar                        | 0.5         |
|   |             | MG EN 3015 (Field trip week before fall ) | 1           |
| <b>TOTAL HOURS</b>                      | <b>14.5</b> | <b>TOTAL HOURS</b>                        | <b>15.5</b> |
| Sophomore Year                          |             |   |             |
| Fall Semester                           |             | Spring Semester                           |             |
| Course                                  | Hours       | Course                                    | Hours       |
| PHYS 2210 Phys. for Scien. And Eng. I   | 4           | PHYS 2220 Phys. For Scien. And Eng. II    | 4           |
| MG EN 3010 Intro to Mining              | 3           | MATH 2210 Calculus III                    | 3           |
| MET E 1610 Intro to Metallurgy          | 2           | CVEEN 2010 Statics                        | 3           |
| GEO 3070 Petrology for Engineers        | 2           | GEO 3060 Structural Geology               | 3           |
| MG EN 2400 Surveying                    | 3           | American Institutions - AI                | 3           |
| MG EN 4990 Seminar                      | 0.5         | MG EN 4990 Seminar                        | 0.5         |
|   |             |   |             |
| <b>TOTAL HOURS</b>                      | <b>14.5</b> | <b>TOTAL HOURS</b>                        | <b>16.5</b> |
| Junior Year                             |             |   |             |
| Fall Semester                           |             | Spring Semester                           |             |
| Course                                  | Hours       | Course                                    | Hours       |
| ECE 2200 Electrical Eng. for non majors | 1.5         | MG EN 3400 Mine Surveying                 | 1           |
| MET E 3070 Statics                      | 3           | MG EN 5010 Underground Mining Methods     | 3           |
| MATH 2250 ODE's                         | 4           | MG EN 5150 Mechanics of Materials         | 3           |
| MG EN 5020 Surface Mining Methods       | 3           | MG EN 5350 Health and Safety MGNT         | 3           |
| MG EN 5320 Hydraulics                   | 3           | General Education* BF                     | 3           |
| CH EN 2300 Thermodynamics               | 2           | MG EN 4990 Seminar                        | 0.5         |
| MG EN 4990 Seminar                      | 0.5         |   |             |
| <b>TOTAL HOURS</b>                      | <b>17</b>   | <b>TOTAL HOURS</b>                        | <b>13.5</b> |
| Senior Year                             |             |   |             |
| Fall Semester                           |             | Spring Semester                           |             |
| Course                                  | Hours       | Course                                    | Hours       |
| Technical Elective †                    | 2           | General Education* FFIR                   | 3           |
| MG EN 5040 Engineering Design           | 2           | General Education FF                      | 3           |
| MG EN 5170 Mine Admin. & Finance        | 2           | MG EN 5080 Permitting and Reclamation     | 2           |
| MG EN 5160 Rock Mechanics               | 3           | MG EN 5090 or 5120 Sr. Design (CW)        | 3           |
| MG EN 5340 Mineral Evaluation           | 3           | MG EN 5050 Ventilation                    | 3           |
| MG EN 4990 Seminar                      | 0.5         | Technical Elective †                      | 2           |
| General Education* HF                   | 3           | MG EN 4990 Seminar                        | 0.5         |
| <b>TOTAL HOURS</b>                      | <b>15.5</b> | <b>TOTAL HOURS</b>                        | <b>16.5</b> |

†Four hours of technical elective should be selected

\*One General Education must meet the International Requirement

## TRANSFER STUDENT PROGRAM OF STUDY

**with Associates Degree-CHEMISTRY, GEOLOGY 1110/1115, MATH COMPLETED THROUGH CALCULUS 2\***

| 1ST YEAR  |             |                                     |             |
|---|-------------|-------------------------------------|-------------|
| Fall Semester   |             | Spring Semester                     |             |
| Requirement   | Hours       | Requirement                         | Hours       |
| MG EN 3015 (held the week before school starts)   | 1           | PHYSICS 2220                        | 4           |
| PHYSICS 2210  | 4           | MATH 2210 Calculus III              | 3           |
| MG EN 3010 Intro to Mining  | 3           | CVEEN 2010 Statics                  | 3           |
| MG EN 1050 Technical Communications   | 2           | GEO 3060 Structural Geology         | 3           |
| MG EN 2400 Surveying  | 3           | MG EN 4990 Mining Seminar           | 0.5         |
| MET E 1610 Intro to Metallurgy  | 2           |                                     |             |
| MG EN 4990 Mining Seminar   | 0.5         |                                     |             |
| <b>TOTAL HOURS</b>  | <b>15.5</b> | <b>TOTAL HOURS</b>                  | <b>13.5</b> |
|   |             |                                     |             |
| 2ND YEAR  |             |                                     |             |
| Fall Semester   |             | Spring Semester                     |             |
| Requirement   | Hours       | Requirement                         | Hours       |
| MG EN 5020 Surface Mining   | 3           | ECE 2200 Electrical Eng             | 1.5         |
| MG EN 5320 Hydraulics   | 3           | MG EN 5010 Underground Mining       | 3           |
| MET E 3070 Statistics   | 3           | MG EN 5150 Mechanics of Materials   | 3           |
| CH EN 2300 Thermodynamics   | 3           | MG EN 5350 Health & Safety Mgnt     | 3           |
| GEO 3070 Petrology for Engineers  | 2           | MG EN 3400 Mine Surveying           | 1           |
| MG EN 4990 Mining Seminar   | 0.5         | MATH 2250 ODE                       | 4           |
|   |             | MG EN 4990 Mining Seminar           | 0.5         |
| <b>TOTAL HOURS</b>  | <b>14.5</b> | <b>TOTAL HOURS</b>                  | <b>16</b>   |
|   |             |                                     |             |
| 3RD YEAR  |             |                                     |             |
| Fall Semester   |             | Spring Semester                     |             |
| Requirement   | Hours       | Requirement                         | Hours       |
| Technical Elective†   | 2           | Technical Elective†                 | 2           |
| MG EN 5040 Engineering Design   | 2           | MG EN 5080 Permitting & Reclamation | 2           |
| MG EN 5050 Ventilation  | 3           | MG EN 5090 or 5120 Sr Design        | 3           |
| MG EN 5160 Rock Mechanics   | 3           | MG EN 5170 Mine Finance             | 2           |
| MG EN 5340 Mineral Evaluation   | 3           | Gen Ed - IR requirement             | 3           |
| MG EN 2200 (fulfills DV) UT Mining History  | 3           | MG EN 4990 Mining Seminar           | 0.5         |
| MG EN 4990 Mining Seminar   | 0.5         |                                     |             |
| <b>TOTAL HOURS</b>  | <b>16.5</b> | <b>TOTAL HOURS</b>                  | <b>12.5</b> |
| †Four hours of technical electives should be selected   |             |                                     |             |
| *Transfer students with associate degrees still need to fulfill DV & IR General Ed requirements |             |                                     |             |
|   |             |                                     |             |

## Undergraduate Mining Engineering Course Descriptions

### **1050 Technical Communications** (2)

Elements of communication in an industrial setting. Introduction to drafting techniques using industry specific standards and software, including CAD software. Course includes public speaking presentation on topic of student's choice based upon industrial technical guidelines.

**2200 Utah Mining History** (3) Fulfills Diversity Requirement. Historical overview of Utah's mining industry and its workforce from the organization of the Utah Territory's first mining district through the 21<sup>st</sup> century.

**2400 Introductory Surveying** (3) Recommended Prerequisite: Trigonometry and MG EN 1050.

Fulfills Quantitative Reasoning B Course. Use of transit, level, total station GPS, and other equipment in field surveying. Practical astronomy, calculation procedures, state plane coordinates, public-land division and introduction to Global Positioning Systems (GPS) and Geographic Information Systems (GIS). Field demonstration and use of surveying equipment illustrate concepts presented in lecture. Laboratory fee assessed.

**3010 Introduction to Mining** (3) Prerequisites: MG EN 1050 and GEO 1110 and 1115

The mineral industry in perspective; mining law, prospecting, mineral exploration, orebody modeling, drilling, blasting and haulage, mining methods, economics, permitting, and reclamation.

**3015 Mine Visits** (1) Prerequisites: MG EN 1990; Must be taken concurrently with MG EN 3010

Participate in field trips to mines in the western U.S. in order to experience mining methods and techniques common in surface and underground mining operations. \*Class held the first week before fall semester classes begin.

**3400 Mine Surveying** (1) Prerequisite: MG EN 2400.

Underground surveying, theory and practice. Topographic mapping and practical astronomy. Lab exercises illustrate concepts presented in lecture. Laboratory fee assessed.

**4990 Mining Seminar** (0.5) Lectures by visiting engineers, managers, attorneys, faculty members, graduate students.

**4999 Honors Thesis/Project** (3) Fulfills Upper-division Communication/Writing.

Restricted to students in the Honors Program working on their Honors degree.

**5010 Underground Mining Methods** (3) Prerequisite: MG EN 1050 and GG 1110, 1111 and 3060.

Recommended Corequisite: MG EN 5150. Fulfills Quantitative Intensive BS Course.

Prospecting, mineral exploration, orebody modeling. General mine design considerations, opening and development, design of underground mining systems, loading and hauling, equipment selection, safety considerations. Required field trips will be held the week prior to the beginning of the semester and/or during Spring Break. Contact Department for trip schedule.

**5020 Surface Mining Methods** (3) Prerequisite: MG EN 1050 and GG 3060. Fulfills Quantitative Intensive BS Course.

Prospecting, mineral exploration, orebody modeling. Surface mining techniques—open pit, area mining, solution mining, auger mining, and dredging. Unit operations—drilling, blasting, loading, haulage, and reclamation. Required field trips will be held the week prior to the beginning of the semester and/or during Fall Break. Contact Department for trip schedule.

**5030 Materials Handling** (2) Prerequisite: PHYCS 2220 and EL EN 1050 and CVEEN 2110.

Motors, three-phase power and industrial power systems; methods and equipment for moving bulk materials: hoisting and conveying.

**5040 Engineering Design** (2) Prerequisite: MG EN 1050 AND 5150. Structural design problems related to mining engineering.

**5050 Mine Ventilation and Air Conditioning** (3) Prerequisite: MG EN 5010 and 5060 and 5320. Fulfills Quantitative Intensive BS Course. Application of fluid dynamics and thermodynamics to design of mine ventilation systems and mine plans. Health and safety aspects of the mine environment, application of ventilation survey instruments and computer simulations. Laboratory fee assessed.

**5080 Mine Permitting and Reclamation** (2) Recommended Prerequisite: MG EN 3010, 5010 and 5020.

Federal agency and Utah mining permit requirements, land disturbances, habitat restoration, hydrology, reshaping, seeding, mulching, and monitoring. Laboratory fee assessed.

**5090 Underground Mine Design** (3) Prerequisite: MG EN 5010 and 5020 and 5040 and 5050 and 5150 and 5160. Fulfills Quantitative Intensive BS Course. Senior design project, integration of mining concepts. Project design and presentation.

**5110 Operations Research** (2)

Introduction to deterministic methods in operations research, with minerals industry applications.

**5120 Surface Mine Design** (3) Prerequisite: MG EN 5020 and 5040 and 5150 and 5160 and 5340. Fulfills Quantitative Intensive BS Course. Senior design project, integration of mining concepts. Project design and presentation.

**5150 Mechanics of Materials** (3) Prerequisite: PHYCS 2220; CVEEN 2010. Fulfills Quantitative Intensive BS Course. Concepts of stress and strain, Hooke's law, torsion of circular bars, bending and deflection of beams, biaxial stress and Mohr's circle, strength of materials. Laboratory testing for material properties, report writing. Emphasis on rock and soil. Laboratory fee assessed.

**5160 Rock Mechanics Applications** (3) Prerequisite: MATH 3150 and MG EN 5150. Fulfills Quantitative Intensive BS Course. Elastic design of underground excavations in rock, support systems—bolting, steel sets, concrete liners, stope fill, mine subsidence; slope stability.

**5170 Mine Administration and Finance** (2) Discussion and application of accounting and financial procedures. Discussion of the vital influence of USA and world scale economics in mining activities and financial performance. Presentation and application of risk analysis methods. Mining company organization, team development, ethical practices, and strategic planning concepts. Student interim and summary written applications.

**5270 Landslides and Slope Stability** (2) Recommended Prerequisite: MG EN, CVEEN, or GG advanced standing. Landslide mechanics and methods of stability analysis.

**5290 Introduction to Finite Element Modeling in Geomechanics** (2) Prerequisite: MATH 3150 and MG EN 5150. Recommended Prerequisite: Programming fundamentals. A programming approach for beginners, development of two-dimensional program for elastic analysis of stress and steady state seepage. Subroutine coding, equation solving.

**5320 Hydraulic Systems** (3) Prerequisite: PHYCS 2210. Fulfills Quantitative Intensive BS Course.

Fundamental statics and dynamics of fluids, applications to mining, including pipe and pump applications, pipe-flow simulation, and open channel flow applications.

**5350 Health & Safety Management** (4) Prerequisite: MG EN 3010 & 3015

This course will cover the tenets of effective mine safety and health as well as the role of the engineer in evaluation of risks including cost benefit analysis, hierarchy of controls, ethics, and whole systems design.

**5360 Risk Management** (2) Suggested Prerequisite: MG EN 5350

Understand the function and use of formal and informal risk management tools. Apply to mining engineering problems and challenges and to safety and health management problems.

**5340 Mineral Evaluation** (2) Prerequisite: MATH 3070 or MET E 3070. Recommended Co-requisite: MG EN 5020.

Ore reserve estimation and grade control under conditions of selective mining.

**5550 Explosives and Rock Blasting** (2) Recommended Prerequisite: MATH 1220 and CHEM 1220. Rock blasting, safety procedures, environmental effects, properties of explosives, and Mining and Civil engineering applications.

**5970 Intern Program** (2) Formulation of an engineering design project, investigation and preparation of report arising from cooperative-education employment in the mining industry.

**5980 Special Topics** (1 to 3) Topics of current interest in mining engineering. Course offerings currently include underground mine environment, acid mine drainage, and hydrological modeling.

**IMPORTANT NOTE: MG EN 5340, Mineral Evaluation, must be taken in the same academic year as the student's selected senior design course—either MG EN 5090, Underground Mine Design, or MG EN 5120, Surface Mine Design. There will be NO EXCEPTIONS to this requirement.**

### Course Schedules and Registration Information

Students may see a current class schedule online (<http://www.acs.utah.edu/prod/bin/student>), or at the Olpin Union Service Desk (no charge with valid student ID).

## Other University Requirements

### I. General Education Requirements

- 1. Intellectual Exploration (IE) - Must be taken for a grade (*minimum: D -*)**

IE Foundation courses are introductory in nature and Integration courses are those that build on the foundation and go into more depth. The Integration courses are usually upper-division. Students are required to take two courses (Foundation or Integration) in each of the four areas, chosen from the list of approved courses in the current Undergraduate Studies Bulletin. (Students in the mining engineering program satisfy the Physical/Life Sciences area with no additional coursework.) They are encouraged (but not required) to take a Foundation and Integration course in each area.
- 2. Lower-division Writing (WR) - Must be taken for a grade (*minimum: C -*)**

Completion of Writing 2010 with a grade of C- or better satisfies the lower-division requirement. Students placed in 1010 (Admissions Index below 96) will be required to earn C- or better before enrolling in 2010. ESL 1050 and 1060 required of students whose English is their second language.
- 3. American Institutions (AI) (*minimum grade: D - or CR*)\***

This is a state requirement for all USHE institutions. To satisfy this requirement students can choose one of the following: History 1700, Economics 1740, or Political Science 1100.
- 4. Quantitative Reasoning (*minimum grade: D - or CR*)\***

(Students in the mining engineering program satisfy this requirement with no additional coursework.) (QA) Math 1030 or higher except 1040 and 1070 (QB) Math 1040 or 1070 will satisfy this requirement (QB not required of BFA or BMus degrees) (A course in calculus, or a higher-level course, will satisfy both QR requirements.

**II. Major and College Requirements** As described above.

**III. Bachelor's Degree Requirements\***If double-counting for major or IE, must be taken for a grade.

- 1. Upper-division Communication/Writing (CW) (*minimum grade: C - or CR*)\*** Upper-division intensive communication/writing course identified by the student's academic department. This requirement is met by completing MG EN 5090 or 5120 (Mining Design Course)
- 2. Diversity (DV) (*minimum grade: C - or CR*)\*** An approved course in cultural diversity is required of all students admitted after Summer 1995. A list of approved courses can be found in the current Undergraduate Studies Bulletin. MG EN 2200 meets this requirement.
- 3. International (IR) (*minimum grade: C-or CR*)\*** An approved course in international studies is required of all students after Summer 2007. An approved course listing may be found on line. The International Requirement cannot simultaneously fulfill the Diversity Requirement.
- 4. Bachelor of Science / Bachelor of Arts**
  - a. BS degree requires completion of two upper-division quantitatively intensive courses (6 semester hours) from an approved list (*minimum grade: D - or CR*)\*
  - b. BA degree requires fourth-semester (2020-level) proficiency in a second language (*minimum grade: C - or CR*)\*
- 5. Total Semester Credit Hours**

A minimum of 122 semester credit hours is required for a bachelor's degree.
- 6. Upper-division Hours**

At least 40 of the required 122 semester hours must be 3000-level or above.
- 7. Minimum Cumulative Grade-point Average** Students must have at least 2.0 U of U cumulative GPA to graduate from the University of Utah. Transfer GPA is not combined with U of U GPA for this requirement. Meeting the departmental requirements will result in a GPA higher than 2.0.
- 8. Residency**
  - a. Of the total hours required for graduation, at least 30 must be earned in residence at the University of Utah. (Correspondence courses, credits by exam, and petitioned courses do not count toward the residency requirement.)
  - b. In addition, 20 of the last 30 hours must be earned in residence at the University of Utah.
- 9. Application for Graduation** at least two semesters before completing requirements for the degree, students should apply for graduation at the Graduation Window on the second floor of the Student Services Building.



# UNIVERSITY GRADUATION REQUIREMENT WORKSHEET

Effective Fall 2008

Name \_\_\_\_\_ Major \_\_\_\_\_ Date \_\_\_\_\_ Advisor \_\_\_\_\_

**\*\*\*Keep this worksheet for your records and future advising\*\*\***

This is an **"unofficial"** worksheet. Total hours, upper-division hours, and all other graduation requirements should be verified when you apply for graduation, **one year** before your projected graduation date.

## CREDIT HOUR and GPA REQUIREMENTS

- 2.00 MINIMUM CUM GPA
- 40 UPPER-DIVISION SEMESTER HOURS
- MINIMUM 122 SEMESTER HOURS
- RESIDENCY HOURS REQUIREMENT

## GENERAL EDUCATION REQUIREMENTS

### AMERICAN INSTITUTIONS

(minimum grade D- or CR)\*

HIST 1700, ECON 1740, or POLS 1100 (AI) \_\_\_\_\_

### WRITING

(minimum grade C-)

Writing 2010 (WR) \_\_\_\_\_

### QUANTITATIVE REASONING

(minimum grade D- or CR)\*

Quantitative Reasoning - Math 1030 or higher (*except statistics*) (QA) \_\_\_\_\_

Quantitative Reasoning - Statistics or Logic (from approved list) (QB) \_\_\_\_\_

### INTELLECTUAL EXPLORATIONS (IE)

(minimum grade D- or CR)\* (2 courses in each area)

Approved courses found at: [www.utah.edu/students/catalog.html](http://www.utah.edu/students/catalog.html)

(Click the desired semester and then click "Gen Ed & Bachelor Degree Courses" at the top of the page)

Fine Arts (FF) \_\_\_\_\_

Fine Arts (FF) \_\_\_\_\_

Humanities (HF) \_\_\_\_\_

Humanities (HF) \_\_\_\_\_

Physical/Life Science (SF) \_\_\_\_\_

Physical/Life Science **OR** Applied Science (SF) OR (AS) \_\_\_\_\_

Social/Behavioral Science (BF) \_\_\_\_\_

Social/Behavioral Science (BF) \_\_\_\_\_

#### Notes:

- Course requirements in the student's major automatically satisfy IE requirements in that area.
- Students should contact their major advisor for information on specific IE courses required as part of the major.

## BACHELOR'S DEGREE REQUIREMENTS

UPPER-DIVISION COMMUNICATION/WRITING (C- or CR)\* (CW) \_\_\_\_\_

DIVERSITY (C- or CR)\* (DV) \_\_\_\_\_

UPPER DIVISION INTERNATIONAL \*\* (C- or CR)\* (IR) \_\_\_\_\_

BS QUANTITATIVE INTENSIVE REQUIREMENT (C- or CR)\*+ (QI) \_\_\_\_\_

(Two upper-division courses required) **OR** (QI) \_\_\_\_\_

BA LANGUAGE REQUIREMENT (C- or CR)\* \_\_\_\_\_

## MAJOR REQUIREMENTS

Research majors and their requirements by going to Departmental home pages at [www.utah.edu/academics/index.html](http://www.utah.edu/academics/index.html)

(Minimum grade does not apply to pre-requisites. Please check with department first)

\*If the course is a requirement for a major it **must** be taken for a letter grade. CR/NC is NOT an option

\*\* (IR) required of students who enroll at the U for the first time Fall 2007 or later. Starting Fall 2013, required of all students regardless of enrollment date. +Minimum C- required for QI's for all students starting enrollment at the U Fall 2008 or later. D- grade acceptable for students who enrolled at the U prior to Fall 2008 and graduate by Summer 2013. Starting Fall 2013 a minimum C- grade will be required for all B.S. degree students, regardless of initial enrollment date.

### Transfer Credit

Transfer credit will be granted for a course or courses taken at another accredited institution, based on criteria established by the University Registrar. In general, the course content must be equivalent to the content of a corresponding required course at the University of Utah, and a minimum grade (usually C or higher) must be earned. Additional information can be found at [http://admissions.utah.edu/undergraduate/transfer/guides/major/mg\\_en.php](http://admissions.utah.edu/undergraduate/transfer/guides/major/mg_en.php)

The awarding of transfer credit for General Education requirements is determined by the University Registrar. Transfer credits awarded for requirements specific to the mining engineering degree will be determined by the mining engineering department.

### AP Credit

The University of Utah grants hours credit for AP test scores of 3 or above. However, the College of Science does not necessarily exempt students from required courses when they have received an AP test score of 3 for a corresponding course. The score of 3 represents approximately a C but covers a very broad range and can represent a fairly weak performance. For this reason, it is not always in the best interest of a student to exempt him or her from a course based on a score of 3 on an AP test. The primary issue within the college is to avoid getting a student in "over his head" if that student is exempted from a course on the basis of a weak AP score. Following is the policy for AP credit:

**Chemistry.** AP scores of 3, 4, or 5 gain a student exemption from Chem 1210-1220.

**Mathematics.** Student placement for math is based on AP; ACT; SAT; Accuplacer exam scores; and transfer credit. Note that exam scores expire after two years.

Placement based on AP test scores on the AB or BC calculus test

| AP Test | Score  | Placement         |
|---------|--------|-------------------|
| AB      | 3      | Math 1210         |
| AB      | 4      | Math 1220 or 1250 |
| AB      | 5      | Math 1220 or 1250 |
| BC      | 3      | Math 1220         |
| BC      | 4 or 5 | Math 1260 or 2210 |

Placement based on ACT scores

| Score       | Placement                        |
|-------------|----------------------------------|
| Below 18    | Take MATH 990                    |
| 18-22       | Take MATH 1010                   |
| 23-27       | Take MATH 1030, 1050, 1060, 1090 |
| 28 or above | Take MATH 1100, 1210, 1310       |

If prerequisites are met with a transfer course that was taken at a college or university outside of Utah a permission code should be requested as the current software does not recognize out of state transfer courses. Permission code requests can be made at [www.math.utah.edu](http://www.math.utah.edu). This is a brief summary of current math registration requirements; a complete explanation of math department policies can be found at [www.math.utah.edu](http://www.math.utah.edu).

**Physics.** Physics will grant exemption from Physics 2210 and/or Physics 2220 for AP scores of 4 or 5 in the C-Mechanics and C-Electricity and Magnetism tests. They believe, from experience, that exempting a student with a score of 3 is likely to cause the student difficulties in subsequent courses. A score of 4 or 5 on the B test will exempt the student from Physics 2010-2020 (the non-calculus, pre-med course).

**CLEP Credit** College credit may also be obtained by passing College Level Entrance Placement (CLEP) tests to fulfill certain liberal education or general education requirements. Please contact the Academic Advising office (450 SSB, 581-8146) for additional information.

## Minor Courses of Study

The department of mining engineering does not offer a minor. Mining engineering students may choose to minor in another field. Two common minors chosen by mining engineering students are mathematics and Spanish. Some students also get two bachelor's degrees. However, they must be careful in doing so, to ensure that early graduation in the non-mining engineering program doesn't alter their scholarship status in the mining engineering program, nor inhibit their timely completion of the required courses in mining engineering

## Financial Aid and Scholarship Information

The Department of Mining Engineering offers a variety of scholarships. Students are encouraged to apply for these scholarships. Scholarship applications are available in the department office and online.

The Department offers Browning Academic Scholarships to all mining engineering students. These scholarships are awarded by decision of the Browning Selection Committee, primarily on the basis of cumulative grade-point average (GPA) and courses taken. These scholarships are described below.

### Browning Scholars

|               |   |
|---------------|---|
| Award Level:  | \$2,000 per semester, up to \$4,000 per year.   |
| Eligibility:  | <ul style="list-style-type: none"> <li>• Minimum, cumulative GPA of 3.000 from the immediate, prior institution.</li> <li>• ACT scores may also be used to rank candidates.</li> </ul>  |
| Continuation: | <ul style="list-style-type: none"> <li>• Maintain a minimum, cumulative GPA of 3.000 for all University of Utah courses.</li> <li>• Complete a minimum of 30 semester-hours per year and must follow the published curriculum as closely as possible.</li> <li>• Support for any student will not be given for more than five academic years.</li> <li>• Leaves of absence, will not count toward the five-year limit.</li> </ul> |
| Evaluation:   | <ul style="list-style-type: none"> <li>• Continuing awards will be evaluated each semester, and funds will be released to the student <i>only</i> after the undergraduate advisor reviews the student's cumulative GPA and schedule for the coming semester.</li> <li>• Students will be informed of their status promptly.</li> </ul>  |

### Distinguished Browning Scholars

|               |   |
|---------------|---|
| Award Level:  | \$2,500 per semester, up to \$5,000 per year; 20 awards maximum/year  |
| Eligibility:  | <ul style="list-style-type: none"> <li>• Students must have completed at least 30 semester-hours of required courses.</li> <li>• Minimum, cumulative GPA of 3.400 for University of Utah coursework .</li> </ul>  |
| Continuation: | <ul style="list-style-type: none"> <li>• Maintain a minimum, cumulative GPA of 3.40 for all University of Utah courses.</li> <li>• Students must complete a minimum of 30 semester-hours per year, and must follow a schedule approved by the Department's Undergraduate Advisor.</li> <li>• Students must follow the published curriculum as closely as possible.</li> <li>• Support for any student as a Distinguished Browning Scholar will not be given for more than four academic years.</li> <li>• Leaves of absence, during which no classes are taken, will not count toward the five-year limit.</li> </ul> |
| Evaluation:   | <ul style="list-style-type: none"> <li>• Continuing awards will be evaluated each semester, and funds will be released to the student <i>only</i> after the undergraduate advisor reviews the student's cumulative GPA and schedule for the coming semester.</li> <li>• Students will be informed of their status promptly.</li> <li>• Students who no longer qualify as Distinguished Browning Scholars will automatically be considered for qualification as Browning Scholars.</li> </ul>  |

On occasion, students may need to take ‘makeup’ courses to rebuild their math or other skills. Where this is the case, allowances will be made in completion and scholarship requirements.

In some cases, the Department also offers tuition assistance. Tuition assistance is offered to encourage students who do not meet the requirements of the Browning Academic Scholarship, but are deemed likely to complete the degree and become successful mining engineering. The Browning Selection Committee will rank all students who meet the minimum requirements for tuition assistance, and will consider diligence in following the published curriculum for mining engineering majors, participation in Department activities, etc. The criteria for tuition assistance are summarized below. Awarded based on funds remaining after Browning Scholarships dispersed.

Tuition Assistance

|               |   |
|---------------|---|
| Award Level:  | Up to \$1,000 per semester, or \$2,000 per year in the form of a tuition waiver for <i>only</i> those courses leading to completion of a degree in mining engineering.  |
| Eligibility:  | <ul style="list-style-type: none"> <li>• Applied for the Browning Scholarship</li> <li>• Complete at least one semester in the mining engineering program</li> <li>• Minimum, cumulative GPA of 2.200 for all University of Utah courses.</li> <li>• AWARDED AS BROWNING FUNDS ARE AVAILABLE</li> </ul>   |
| Continuation: | <ul style="list-style-type: none"> <li>• Maintain a minimum, cumulative GPA of 2.20 for all University of Utah courses.</li> <li>• Complete a minimum of 30 semester-hours per year, and must follow a schedule approved by the Department Undergraduate Advisor or Chair</li> <li>• Students must follow the published curriculum as closely as possible.</li> <li>• Support will not be given for more than four academic years.</li> <li>• Leaves of absence, during which no classes are taken, will not count toward the four-year limit.</li> </ul> |
| Evaluation:   | <ul style="list-style-type: none"> <li>• Continuing awards will be evaluated each semester, and funds will be released to the student <i>only</i> after the undergraduate advisor reviews the student’s cumulative GPA and schedule for the coming semester.</li> <li>• Students will be informed of their status promptly.</li> </ul>  |

Student loans, grants, and need-based and other scholarships are also available through the financial aid office (105 SSB, 581-6211).



MinEXPO 2012 – Las Vegas, Nevada

### Related Professional Societies and ASUU student groups

Students are encouraged to participate in professional societies as both members and leaders. These provide valuable opportunities for leadership, service, social interaction, and industrial exposure. Professional societies with student chapters in the College of Mines and Earth Sciences include the following:

- Society for Mining, Metallurgy, and Exploration (SME), Dr. Michael G. Nelson, faculty advisor
- Society of Economic Geologists (SEG), Dr. Erich U. Peterson, faculty advisor
- Women in Mining (WIM) Student Chapter, Pam Hofmann, Staff Advisor
- American Rock Mechanics Association (ARMA) Student Chapter
- Utah Robotics Mining Team, George Chapin, Team Manager

Please see the Department of Mining Engineering (313 WBB, 581-7198) for additional information about membership in these societies.

### Field Trips and Other Activities

Students participate in field trips to mines and other points of interest. Through the Student Chapter of SME (described below) students also attend mining conferences and conventions. Students should be prepared to attend the mandatory field trips that will be associated with the classes listed below.

MG EN 3015 Mine Visits (one week prior to fall semester & required for MG EN 3010 Intro to Mining)  
MG EN 3400 Mine Surveying  
MG EN 5080 Mine Permitting and Reclamation

Additional field trips may be scheduled and these trips will be announced in the weekly, department seminars.

### Annual Awards Banquet

The department hosts an Awards Banquet in the spring of each year. Here the recipients of scholarships are recognized, and awards are given to distinguished alumni and others from the mining community.



*Photo: Students who received Scholarships and Academic Recognition at our Annual Awards Banquet.*



*Inspecting the Dragline at the Black Butte Mine, Wyoming*



*WIM fieldtrip to Rio Tinto Bingham Canyon Mine*

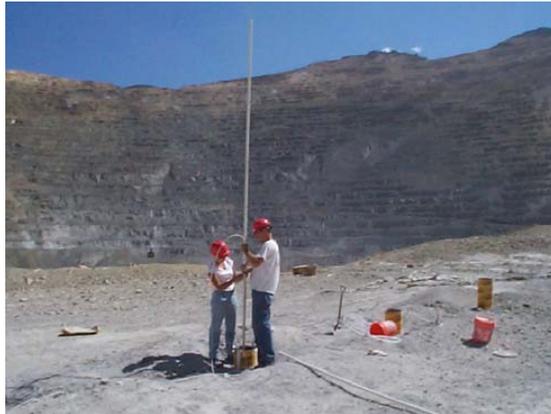


*Going underground at Newmont's Leeville Mine*



*Attending the Mining Hall of Fame Dinner*

Students also have opportunities to participate in a variety of research and internship projects.



*Setting up a Blasting Experiment at Kennecott Utah Copper*

**SME Section Meetings.** The Utah Section of the Society for Mining, Metallurgy, and Exploration holds monthly meetings in Salt Lake City. Students are welcome, and may purchase dinner at a reduced rate. Meetings are normally held on the third Thursday of each month, September through May. Meeting notices will be posted on bulletin boards in the Mining Engineering Department.

**SME Annual Meeting.** The Society for Mining, Metallurgy, and Exploration holds a national meeting each year, normally beginning on the last Sunday of February. Students are encouraged to attend the meeting, and many events are designed especially to benefit student attendees. In addition, much can be learned from attending technical sessions and the exhibits by vendors and suppliers. The student chapter of SME organizes transportation and lodging for the annual meeting, and ASUU funds are usually available to help with some of the costs for students.



**MinEXPO.** Every four years, the mining industry holds a major trade show in Las Vegas, Nevada. Students are encouraged to attend, to participate in technical sessions and the exhibition. Again, the student chapter of SME organizes transportation and lodging for the annual meeting, and ASUU funds are usually available to help with some of the costs for students.