The Department of Metallurgical Engineering at the University of Utah is accredited by ABET, Inc.
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Introduction

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

Brief Overview of Metallurgical Engineering

Metallurgical Engineering involves the study, design, implementation, and improvement of processes that transform rocks and minerals into metal and mineral products that make our life better. Metallurgical engineering students take courses in: particle separation technology, which focuses on particle separation, processing, and recycling, and includes particle characterization, comminution, size separation, flotation, coal preparation, remediation of nuclear materials, automatic control and process engineering of particles including metal powders, energy-related minerals, pigments, and ceramics; chemical metallurgy, which focuses on metal removal, processing, and recycling into a purified metal and includes heterogeneous reaction kinetics, transport phenomena, computer modeling, leaching, solution purification, ion exchange, solvent extraction, precipitation, roasting, reduction, smelting, ironmaking and steelmaking; and physical metallurgy, which focuses on metal casting, forming, joining, and metal property evaluation and optimization and includes phase transformations, powder metallurgy, metallography, functionally graded materials, composites, magnetic materials, thin film processing, fatigue, positron annihilation, rapid solidification, metal failure analysis, and corrosion. (For additional information, please see http://www.metallurgy.utah.edu/)

Financial Aid and Scholarship Information

The Department of Metallurgical Engineering offers a variety of scholarships. Students are encouraged to apply for these scholarships. Scholarship applications are available in the department office, 412 WBB, ph (801) 581-6386, or online at www.metallurgy.utah.edu/. Students should also consider applying for other scholarships offered by professional societies, as well as general University of Utah scholarships. Student loans, grants, and need-based scholarships are also available through the financial aid office at 105 SSB – ph (801) 581-6211. See financialaid.utah.edu for FASFA and other scholarships.

Career Opportunities

Metallurgical Engineers play a key role in the nation’s well-being because of the importance of metals and minerals in modern society. The broad use of metals and mineral in our society leads to a wide array of job opportunities. Our graduates work for companies such as Lockheed-Martin, BHP Steel, Rio Tinto, Nucor Steel, Aker Kvaerner, Freeport McMoRan, Chevron, GSC Foundries, Westinghouse, US Nuclear Regulatory Commission, Boart Longyear, Barrick, 1M Flash Technologies, Williams International, Newmont Gold, IBM, National Semiconductor, MEMC Electronics, Fluor Daniel, Samsung, Parker Aerospace, Johnson Matthey, Idaho National Engineering and Environmental Laboratory, etc. The average starting salary for students graduating with a bachelor's degree in Metallurgical Engineering is approximately $60,000/yr. Job placement for metallurgical engineers is typically near 100%.
### Suggested Course Schedule for New Students Majoring in Metallurgical Engineering
(For students working 15-20 hours or less per week)

**Freshman Year**

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHEM 1210</strong> General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td><strong>CHEM 1215</strong> General Chemistry I Lab</td>
<td>1</td>
</tr>
<tr>
<td><strong>MATH 1210</strong> Calculus I</td>
<td>4</td>
</tr>
<tr>
<td><strong>MET E 1610</strong> Intro Extrac Metallurgy</td>
<td>2</td>
</tr>
<tr>
<td><strong>MET E 1620</strong> Intr Phys Metallurgy</td>
<td>2</td>
</tr>
<tr>
<td><strong>MET E 4990</strong> Undergraduate Seminar</td>
<td>0.5</td>
</tr>
<tr>
<td><em><em>Gen Ed</em>/Electives†</em>*</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>16.5</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MATH 2210</strong> Calculus III</td>
<td>3</td>
</tr>
<tr>
<td><strong>MET E 4990</strong> Undergraduate Seminar</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>MET E 3070</strong> Statistical Methods</td>
<td>3</td>
</tr>
<tr>
<td><strong>MET E 3220</strong> Mater Energy Balances</td>
<td>2</td>
</tr>
<tr>
<td><strong>PHYS 2210</strong> Phys for Scien &amp; Eng</td>
<td>4</td>
</tr>
<tr>
<td><em><em>Gen Ed</em>/Electives†</em>*</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>15.5</td>
</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ME EN 1300</strong> Statics/Strength</td>
<td>4</td>
</tr>
<tr>
<td><strong>MET E 4990</strong> Undergraduate Seminar</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>MET E 5260</strong> Physical Metallurgy</td>
<td>3</td>
</tr>
<tr>
<td><strong>MET E 5680</strong> Mineral Processing II</td>
<td>3</td>
</tr>
<tr>
<td><em><em>Gen Ed</em>/Electives†</em>*</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>16.5</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MET E 4990</strong> Undergraduate Seminar</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>MET E 5450</strong> Mechanical Metallurgy</td>
<td>3</td>
</tr>
<tr>
<td><strong>MET E 5700</strong> Hydrometallurgy</td>
<td>3</td>
</tr>
<tr>
<td><strong>MET E 5710</strong> High Temp Chem Procg</td>
<td>4</td>
</tr>
<tr>
<td><em><em>Gen Ed</em>/Electives†</em>*</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>16.5</td>
</tr>
</tbody>
</table>

| Spring Semester                  |
|-------------------------------|----------------------------------|
| **CHEM 3060** Physical Chemistry I | 4                               |
| **ECE 2200** El En for Nonmajors | 1.5                            |
| **ECE 2210** El En for Nonmajors | 3                               |
| **MET E 3500** Fluid Flow       | 3                               |
| **MET E 5750** Rate Processes   | 3                               |
| **Gen Ed*/Electives†**        | 3                               |
| **Total Hours**               | 14.5                            |

**Total Hours**

*Gen Ed includes intellectual exploration, diversity (DV), writing (WR), communication/writing (CW), international (IR), and American institution (AI) requirements with applicable double counting (i.e. students can choose two intellectual exploration courses that will also count as DV and IR courses). Note that the QA, QB, QI, WR, and SF requirements are met by the courses listed in the curriculum.

†Students are required to take eight semester hours of approved technical elective courses. Most courses that are 3000-level and above in the Colleges of Science, Engineering, and Mines and Earth Sciences that do not duplicate required courses are acceptable as technical electives. The department recommends that Professional Writing (WRTG 3015) be taken to satisfy one of the technical electives and the University's upper-division comm/writing requirement.

‡Either of the two courses in brackets can be used to fulfill the associated department requirement.

This is a suggested schedule and is subject to change without notice. Please see department advisor before registering. The University of Utah Bulletin General Catalog remains the official document for graduation purposes.

Many scholarships are offered through the department for freshmen and continuing departmental majors who qualify academically. For further information please contact:

University of Utah  
Department of Metallurgical Engineering  
135 S 1460 E Rm 412  
Salt Lake City UT 84112–0114  
phone (801) 581–6386  
fax (801) 581–4937  
email metal-advising@lists.utah.edu  
web http://www.metallurgy.utah.edu/

January 29, 2014
Flow of Prerequisites, Metallurgical Engineering, University of Utah

**Recommended High School Prerequisites**
- College Algebra
- Trigonometry

### Freshman Fall Semester
- MET E 1620 Intro Phys Metallurgy* (recom Chem E 1220)
- CHEM 1210 General Chemistry I (Math 1050 College Algebra)
- MATH 1210 Calculus I (math ACT of 28, or C or better in Math 1050 College Algebra & Math 1060 Trig)
- MET E 4990 Undergraduate Seminar*

### Freshman Spring Semester
- WRTG 2010 Intermediate Writing (prereq Wrtg 1010 or placement)
- CHEM 1220 General Chem II (prereq Chem 1210)
- CHEM 1225 General Chem II Lab (coreq Chem 1220)
- MATH 1210 Calculus II (prereq Math 1210)
- CS 1000 Engineering Computing (coreq CS 1010 Intro to Unix, Math 1210)

### Sophomore Fall Semester
- MET E 3220 Mater Energy Balances (Met E 1610, recom Chem 1220, Math 1210)
- MATH 2210 Calculus III (prereq Math 1220)
- PHYS 2210 Phys for Scienc & Eng (prereq Math 1210)
- MET E 3070 Statistical Methods (recom prereq College Algebra)

### Sophomore Spring Semester
- MET E 3530 Exp Tech in Metallurgy (recom Chem 1220)
- MET E 3620 Thermodyn & Phase Eq (Met E 1610, recom Chem 1220, Math 2210)
- MET E 5670 Mineral Processing I (recom Math 2250, Met E 3500)
- MET E 5680 Mineral Processing II (prereq Math 2250)
- PHYS 2220 Physics for Scienc & Eng (Phys 2210, Math 1220)
- PHYS 1800 Gen Physics Lab (prereq Phys 2210, recom coreq 2220)

### Junior Fall Semester
- MET E 5260 Physical Metallurgy (recom Met E 1620)
- MET E 4990 Undergraduate Seminar*
- MET E 5670 High Temp Chem Prog (recom Met E 3620)
- MET E 4990 Undergraduate Seminar*
- ECE 2200 or ECE 2210 El En for Nonmajors (Math 2250 & Phys 2220)

### Junior Spring Semester
- MET E 5750 Rate Processes (recom Math 2210)
- CHEM 3060 Physical Chemistry I (prereq Math 2210, Phys 2220, Chem (1220 or 1221), rec prereq Math 2250)
- ECE 2200 or ECE 2210 El En for Nonmajors (Math 2250 & Phys 2220)

### Senior Fall Semester
- MET E 5780 Metals Processing (recom Met E 1620, 5260, 5450)
- MET E 5760 Procs Synth Design/Econ (recom Met E 5260, 5670, 5700, 5710)

### Senior Spring Semester
- MET E 5690 Process Eng Statistics (recom Met E 3070)

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*no prerequisites*

\[ \text{v. 12/8/11} \]
Undergraduate Metallurgical Engineering Course Descriptions
(see also http://www.acs.utah.edu/gencatalog/catalog.html)

1001 Energy Resources in a Sustainable World (3) Cross listed as ENVST 1001, GEOG 1001, GEO 1001. Fulfills Physical/Life Science Exploration.
Energy is an important resource at all levels of social development. Course examines the dependency of societies on energy resources and the interaction between social goals, technology, economics, environmental concerns, and energy resources. Fossil fuels, nuclear energy, and renewable energy resources are discussed. Natural laws, the scientific method, and the application of technology are presented in the context of energy production and efficiency of utilization. Environmental pollution and energy conservation are stressed. Importance of energy resources in sustaining the world population, improving the quality of life, and assisting developing countries is also discussed.

1610 Introduction to Extractive Metallurgy (2)
Introduction to mineral resources, extraction methods and plant practices, use of metals and alloys. Historical perspective of role of metallic materials in human civilization.

1620 Introduction to Physical Metallurgy (2)
Basic principles of chemistry and physics applied to structure of materials especially metals and alloys. Phase diagrams, physical and mechanical behavior of solids.

3070 Statistical Methods in Earth Sciences and Engineering (3) Laboratory, Lecture. Recommended Prerequisite: College Algebra. Fulfills Quantitative Reasoning B Requirement
Probability density functions, fundamental sampling distributions, one- and two-sample estimation problems. Selected examples from mining, geology, metallurgy, and meteorology will be used to illustrate statistical methods. Lab exercises will use examples from earth sciences and engineering.

3220 Material and Energy Balances (2) Recommended Prerequisites: CHEM 1220 and MATH 1210. Fulfills Quantitative Intensive BS Course.
Conservation of mass and energy. Basic thermophysics and thermochemistry. Computation of material and energy flows in chemical, metallurgical, and combustion processes. Applications to process engineering.

3500 Fluid Flow (3) Laboratory, Lecture. Recommended Prerequisite: MET E 3220 and MATH 2250. Fulfills Quantitative Intensive BS Course.

3530 Experimental Techniques in Metallurgy (2) Laboratory, Lecture. Recommended Prerequisite: CHEM 1220.
One laboratory period. Laboratory fee assessed. Principles and practice involved in qualitative as well as quantitative materials characterization by optical, mechanical testing, X-ray, spectroscopic and electron microscopic techniques. Laboratory sessions involve experiments on the basis of instruments and subject materials discussed in lectures.

3620 Thermodynamics and Phase Equilibria (4) Recommended Prerequisite: CHEM 1220 and MATH 2250. Fulfills Quantitative Intensive BS Course.
Application of thermodynamic data to predict stable phases in aqueous and high temperature systems. Construction and use of partial pressure diagrams, Eh-pH diagrams, temperature-composition diagrams in related mineral and metallurgical systems. Activities and equilibria in slag-metal and gas-metal systems.
4990 Undergraduate Seminar (.5) Seminar.
Topics relevant to metallurgical engineering are discussed. This course is required of all undergraduate students in metallurgical engineering each year.

4999 Honors Thesis/Project (3) Departmental consent. Honors Thesis
Project. Fulfills Intensive Writing/Communication. Restricted to Students in the Honors Program working on their Honors degree.

5180 The Mineral Industries and the Environment (2)
A study of mineral-processing and the environment including relevant laws and regulations, economic values of the industries, case studies, new technologies for waste treatment, competitive use of resources. Offered through DCE.

5210 Nuclear Materials: Processing, fabrication, use and disposal (3) Prerequisite: Introductory level metallurgy or materials science course.
Meets with MET E 6210. The course will provide an in-depth coverage of the metallurgy of the materials used in the nuclear reactor core, power generation, reprocessing, transport, and waste disposal systems.

5240 Principles and Practice of Transmission Electron Microscopy (3) Prerequisite: Engineering/College Physics Course or permission of instructor.
Meets with MET E 6240. The course will cover the basic principles of electron diffraction in materials and the operation of transmission electron microscope. Hands on experience with preparation of samples of various materials and structures in a TEM will be provided in laboratory sessions to illustrate the principles and practice of various TEM techniques. The course will consist of 2 lecture sessions and 1 laboratory session per week.

Phase transformations in metals and alloys: Elementary physical chemistry of phases, phase diagrams and phase rule application, diffusion in solids, structure of interfaces, nucleation and growth, solidification, pearlitic, bainitic, massive and order-disorder transformations, precipitation, elementary treatment of martensitic transformation, iron-carbon system, and heat-treatment of steels. Laboratory sessions illustrate principles developed in lectures.

5270 Powder Metallurgy (2) Meets with MET E 6270. Recommended Prerequisite: MET E 1620 and 5260.
Powder preparation, rapid-solidification processing principles, powder characterization, theory of compaction, sintering, full-density processing, powder metallurgy component design, compact characterization, application of powder metallurgy processing to structural, electrical, magnetic, and biomedical components.

5450 Mechanical Metallurgy (3) Meets with MET E 6450. Recommended Prerequisite: MET E 1620. Fulfills Quantitative Intensive BS Course.
Stress and strain analysis, Mohr's circle, yield criteria, elastic and plastic deformation, deformation of single and polycrystals, dislocations, strengthening mechanisms, fatigue, creep and fracture of metals. Also involves a design problem of material selection for gas turbine blades on the basis of mechanical property requirements.

5600 Corrosion Engineering (2) Recommended Prerequisite: CHEM 1220.
Basic principles of corrosion, including forms and mechanisms of corrosion; corrosion prevention by cathodic protection and by coatings and materials selection; testing methods.

5640 Dislocation Theory (2) Meets with MET E 6640. Recommended Prerequisite: MET E 1620.
Foundations of dislocation theory, dislocation movements, forces, interactions, and role of dislocations in strengthening mechanisms in solids.
5660 Surfaces and Interfaces (2) Recommended Prerequisite: MET E 362 and CHEM 3060.
  Capillarity, films on liquids, Gibbs adsorption, surface spectroscopy, electrical phenomena at interfaces, solid surfaces, wetting, nucleation.

5670 Mineral Processing I (3) Laboratory, Lecture. Recommended Prerequisite: MATH 2250. Fulfills Quantitative Intensive BS Course.
  Laboratory fee assessed. One laboratory period. Particulate technology, particle size distribution, sizing methodology, size reduction and classification processes, solid-liquid separation methods.

5680 Mineral Processing II (3) Meets with MET E 6680. Laboratory, Lecture. Recommended Prerequisite: MATH 2250. Fulfills Quantitative Intensive BS Course.
  Laboratory fee assessed. One laboratory period. Sampling, particle characterization, separation of particulate materials. Physics, chemistry, and engineering design applied to gravity, magnetic, electrostatic and froth flotation separations.

5690 Process Engineering Statistics (2) Laboratory, Lecture. Recommended Prerequisite: MET E 3070.
  Laboratory fee assessed. One laboratory period. Advanced statistical methods applied to solve engineering problems and to analyze massive experimental database. One factor experiments, simple, and multiple linear regression, statistical quality control and response surface method.

5700 Hydrometallurgy (3) Meets with MET E 6700, MET E 6700. Laboratory, Lecture. Recommended Prerequisite: MET E 3620. Fulfills Quantitative Intensive BS Course.
  Laboratory fee assessed. One laboratory period. Thermodynamic and kinetic fundamentals of commercially important metal extraction, recovery, refining, and removal processes in aqueous media.

5710 High Temperature Chemical Processing (4) Laboratory, Lecture. Recommended Prerequisite: MET E 3620. Fulfills Quantitative Intensive BS Course.
  Laboratory fee assessed. One laboratory period. Fundamentals of commercially important nonferrous and ferrous pyrometallurgical extraction. Thermodynamics and kinetics of high-temperature processes.

5750 Rate Processes (3) Recommended Prerequisite: MATH 3150. Fulfills Quantitative Intensive BS Course.
  Treatment of heat and mass transfer problems in metallurgical engineering. Interaction of chemical kinetics, and transport processes in metallurgical reactions.

5760 Process Synthesis, Design and Economics (3) Recommended Prerequisite: MG EN 5170 and MET E 5260 and 5670 and 5700 and 5710. Fulfills Quantitative Intensive BS Course.
  Metallurgical process synthesis, flowsheet development, and associated economic analysis.

5770 Electrometallurgy (2) Recommended Prerequisite: MET E 3620.
  Principles of electrodeposition and electrowinning, including modern practices.

5780 Metals Processing (2.5) Laboratory, Lecture. Recommended Prerequisite: MET E 1620 and 5260 and 5450.
  Primary and secondary metal-shaping processes: casting and solidification of metals, powder metallurgy, machining and joining of metals. Emphasis will be on process design. Laboratory illustrates principles developed in lecture.

5790 Metal Failure Analysis (2) Recommended Prerequisite: MET E 1620.
  Metal-failure analysis, metal-failure modes. Methods and procedures of analysis.

5800 Special Topics in Metallurgical Engineering (.5 to 3) Special Topics.

5830 Senior Project (.5 to 3) Departmental consent. Special Projects.
  Senior students investigate research or design problem and submit report or thesis.
Advising Information for Math Courses

Finishing MATH 1210 and 1220 during the first year is very important for students desiring to complete a B. S. degree in metallurgical engineering in four years. The University of Utah requires a recent (within two years) ACT, SAT, Accuplacer, or AP/IB Calculus exam score, or a recent concurrent enrollment (college-level course) grade to evaluate your math proficiency before deciding which math course you are allowed to take. Transfer students can satisfy prerequisites with transfer math classes. If you have not had a math course or placement test within two years, you will be required to take the Accuplacer exam.

If taking the Accuplacer exam, make sure you prepare well because your score determines your placement. Free practice exams are often available on the web through simple search engine queries. The Math department's math boot camps (MATH 10 and MATH 15) are accelerated review courses sometimes offered in one-week sessions. There are on-line prep tools such as ALEKS for a fee. The additional resources are particularly helpful for those who have not had a recent math course. Please see the Math Department's website (http://www.math.utah.edu/) for more information on placement and study resources.

Students who will take a leave of absence or are nontraditional/part-time should consider their math course schedules carefully. The Math department has indicated that if students take MATH 1210 or higher before taking a leave of absence, it is generally easy to receive instructor approval to continue with the next math course, provided the previous grade was good, and it has not been more than three or four years since taking the previous course. In contrast, if students complete only a lower level math course such as MATH 1050 before a leave of absence they will be required to pass the Accuplacer exam at a sufficient level before registering for the next math class upon returning.

### Math Placement Guide

<table>
<thead>
<tr>
<th>Math ACT Score(s)</th>
<th>Math SAT Score(s)</th>
<th>Accuplacer Scores*</th>
<th>Course Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 or lower</td>
<td>420 or lower</td>
<td>AR &lt; 120 or EA &lt; 54</td>
<td>Math 990 Elementary Algebra</td>
</tr>
<tr>
<td>18-22</td>
<td>430-530</td>
<td>54 &lt;= EA or CLM &lt; 50</td>
<td>Math 1010 Intermediate Algebra**</td>
</tr>
<tr>
<td>23-27</td>
<td>540-620</td>
<td>CLM &gt;= 50</td>
<td>Math 1030 Quantitative Reasoning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Math 1040 Statistics &amp; Probability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Math 1070 Statistical Inference</td>
</tr>
<tr>
<td></td>
<td>CLM &gt;= 60</td>
<td></td>
<td>Math 1050 College Algebra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Math 1060 Trigonometry</td>
</tr>
<tr>
<td>24-27</td>
<td>58-620</td>
<td>CLM &gt;= 65</td>
<td>Math 1080 Precalculus</td>
</tr>
<tr>
<td>28 or higher</td>
<td>630 or higher</td>
<td>CLM &gt;= 80</td>
<td>Math 1100 Quantitative Anslysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>90 &lt;= CLM &lt;= 94***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Math 1210 Calculus I</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>95 &lt;= CLM &lt;= 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Math 1310 Engineering Calculus I</td>
</tr>
</tbody>
</table>

*AR = Arithmetic Test. EA = Elementary Algebra Test. CLM = College Level Math Test.

**If a student places into Math 1100, the student should take both Math 1050 and 1060 instead of 1100, since 1050 and 1060 are the prerequisites for Math 1210.
Chemical Placement

Placement in CHEM 1210 General Chemistry I requires one of the following: Accuplacer CLM of 75+, Math ACT of 25+, Math SAT of 600+, or AP Calc AB/BC of at least 2.

Technical Electives

Generally, technical electives are advanced courses that will build a stronger technical background for the future engineer. Upper-division courses (3000-level or above) offered in the colleges of Engineering, Mines and Earth Sciences, and Science, that do not duplicate other required courses, are generally appropriate. The following are some pre-approved technical electives:

- CH EN 3453, 3553, 3603
- CHEM 3000, 3070
- GG 3080
- MSE 3210, 3310, 3410, 5010, 5035
- MATH 5610
- MET E 3080, 5210, 5270, 5600, 5290, 5640, 5610, 5660, 5770, 5790, 5800, 5910
- MG EN 5020, 5030, 5070, 5080, 5340
- WRTG 3400 (recommended as one technical elective)

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

Course Schedules/Registration Information

The current class schedule can be accessed through the web (http://www.utah.edu/students/catalog.php), at the Olpin Union Service Desk (no charge with valid student ID), or by contacting the Scheduling Office (201 S. 1460 E. Room 40, University of Utah, Salt Lake City UT 84112-9056).

Grades and Repeating Courses

Students must receive a grade of C– or better in each of the required courses. Students are allowed to repeat required courses one time only.

Other University Requirements

Please see the Overview of Requirements and the University of Utah Bulletin (http://undergradbulletin.utah.edu/) for general requirements.

Transfer Credit

Transfer credit will be granted for a course(s) taken at another accredited institution so long as a grade of C– or better was received and the course content was equivalent to the content of a corresponding required course in the Metallurgical Engineering curriculum. The grade will not transfer. Transfer credits must be approved by the department.

AP Credit

Please refer to the AP Placement Guide, page 12, or contact the department advisor.
CLEP Credit

College credit may also be obtained by passing College Level Entrance Placement (CLEP) tests to fulfill certain general education requirements. Please contact the Academic Advising office for additional information (450 SSB – (801) 581-8146).

Policy for Internship Technical Elective Credit

Students may earn 0.5 to 2 semester hours of technical elective credit for internship-related work experiences in industry or research labs, provided that the following criteria are met:

1) The student must be mentored by a company engineer.
2) The student must be primarily involved in testing/data analysis or process improvement/development activities where the student has the opportunity to practice and develop engineering skills.
3) 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.
4) The student must register for Special Topics credit during the internship.
5) The student must write and submit a final report of 10 to 30 double-spaced pages, depending upon desired credit, that includes:
   - Literature Survey of General Project Topic(s)
   - 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.

6) The student may be required to make an oral presentation in addition to writing the report.

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.

Related Professional Societies with Student Membership

Students are encouraged to participate in professional societies as both members and leaders. Professional societies provide valuable opportunities for leadership, service, social interaction, and industrial exposure. Societies with student chapters in the metallurgical engineering area include:

- ASM – International
- Society for Mining, Metallurgy, and Exploration (SME)
- The Minerals, Metals, and Materials Society (TMS)
Please see the Department of Metallurgical Engineering for additional information about membership in these societies.
OVERVIEW OF REQUIREMENTS

To earn a bachelor’s degree from the University of Utah you must complete the following requirements and meet minimum academic standards.

IMPORTANT NOTE: The minimum grades are noted for each requirement. However, if a course is also required for your major it MUST be taken for a letter grade and a higher grade may be required.

Academic Standards

1. Total Semester Credit Hours
   A minimum of 122 semester credit hours is required for a bachelor’s degree.

2. Upper Division Credit Hours
   At least 40 of the required 122 semester hours must be at the 3000 level or above. (BUS degrees require 56.) Credits from 2-year schools will not count toward upper division hours.

3. Residency Hours
   a) A minimum of 30 semester hours must be completed at the University of Utah.
   b) 20 of the last 30 semester hours must be completed at the University of Utah.

   Telecourses, Online courses, and courses at satellite campuses count as hours in residence. Independent Study correspondence courses, petitioned courses and exam credits do not.

4. Minimum 2.0 Cumulative GPA
   A 2.0 is the minimum GPA to stay in Good Standing at the University of Utah. Some departments may require higher GPAs.

5. Apply for Graduation
   At least two semesters before graduation you must file an application to graduate at the Graduation window on the second floor of the Student Services Building.

General Education Requirements

1. American Institutions (AI) (D- or CR)
   One course from the approved list

2. Lower Division Writing (WR2)
   (C- Must be taken for a letter grade)

   Most students will take the Writing 1010/2010 series to complete this requirement. Students for whom English is their second language take the ESL 1040/1050/1060 series. Honors program students can take HONORS 2211.

3. Quantitative Reasoning (QA and QB) (D- or CR)
   (QA) Math 1030 or higher except Math 1040, 1060, or 1070
   (NOTE: A grade of C or higher is required for any necessary prerequisite(s) to the QA requirement.)
   (QB) One course in statistics or logic from the approved list.
   (NOTE: A course in calculus or higher math satisfies both QA and QB.)

4. Intellectual Exploration (IE) (D- or CR)
   Take two courses from approved lists in each of the following four areas:
   - Fine Arts (FF)
   - Humanities (HF)
   - Physical, Life and Applied Science (SF) (AS)
   - Social and Behavioral Science (BF)

   (You are not required to take IE courses in the area of your major. See p. 4 to identify the area of your major.)

Bachelor’s Degree Requirements

1. Upper Division Communication/Writing (CW) (C- or CR)
   Choose one course from the approved list. Some departments require a specific course. Meet with your departmental advisor before choosing a course.

2. Diversity (DV) (C- or CR)
   Choose one course from the approved list.

3. Upper Division International Requirement (IR) (C- or CR)
   Choose one course from the approved list or participate in an approved study abroad program (see page 19-IR requirements). Required of all students beginning their enrollment at the U Fall 2007 or after. (Not required of students who took a course at the U prior to Fall 2007 as long as they graduate by summer 2013. Beginning Fall 2013 all students will be required to complete this requirement regardless of their entrance date.)

4. Bachelor of Science and Bachelor of Social Work Upper Division Quantitative Intensive Requirement (QI) (C- or CR)
   Choose two upper division courses from the approved list. Some departments require specific courses. Meet with your departmental advisor before choosing courses.

5. Bachelor of Arts Language Requirement (C- or CR)
   Fourth semester proficiency in a foreign language or American Sign Language

6. Bachelor of Fine Arts, Bachelor of Music
   (Exempt from BA language, BS Quantitative Intensive, and QB Statistics Requirements)

Requirements for a Major

When you enter the University of Utah you are listed as being in premajor status. This is not the same as being declared into a major. To officially declare your major you must meet with the departmental advisor. A list of departmental advisors can be found on page 5.

1. Major Coursework
   See your departmental advisor or run a DARS for a list of requirements for your major.

2. Other Departmental or College Requirements
   Some departments have additional requirements for graduation such as passing comprehensive exams. Check with your departmental advisor.
OVERVIEW OF REQUIREMENTS

Second Bachelor's Degrees
Students who have completed a bachelor's degree recognized by the University and now wish to earn a second bachelor's degree must fulfill the following requirements:
1. All requirements for the major
2. Residency Hours Requirement
3. American Institutions*
4. Lower Division Writing*
5. Upper Division Communication/Writing*
6. Diversity*
7. International Requirement*
8. Current requirements for BS, BA, BFA, BMus, BUS*  
*Not required if completed in the first bachelor's degree

Associate's Degrees
Associate of Arts (AA) and Associate of Science (AS) degrees automatically clear some General Education requirements depending on which school awarded them.

Schools in the Utah System of Higher Education (USHE) and LDS Business College:
All General Education requirements are cleared with the possible exception of American Institutions (AI), which is checked separately by the Admissions Office.

Private schools in Utah and all out of state schools:
Lower Division Writing and all Intellectual Explorations (IE) requirements are cleared automatically. The Admissions Office checks American Institutions (AI), Quantitative Reasoning (QA and QB).

NOTE: an Associate of Applied Science (AAS) degree will not automatically clear any General Education.

Course Numbering System
Noncredit Courses
0001-0999
Lower Division Courses (Freshman and Sophomore)
1000-2999
Upper Division Courses (Junior and Senior)
3000-5999
Graduate Courses
6000-7990
NOTE: These courses cannot be taken by undergraduate students without special permission from the department.

Minimum Grades for General Education and Bachelor's Degree Requirements

<table>
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## UNIVERSITY OF UTAH AP CREDIT AND GENERAL EDUCATION GUIDE

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</table>

**IE = Intellectual Exploration  **QA/QB = Quantitative Reasoning

* A score of 2 on the Calculus AB or Calculus BC will waive the QA Requirement but no credit hours will be awarded.

**Effective Spring 2007 a score of 4 or higher on English Comp/Rdg, Comp/Lit, and Engl Language will be required to waive Writing 2010. A score of 3 will waive Writing 1010.

- When a student has both AP and CLEP credit, AP is counted first and is considered as course work when evaluating General Education requirements. In addition, if college credit has been awarded and duplicates the AP course work, the AP credit will be reduced by the amount of credit previously earned.
- When computing General Education requirements, the minor and major area are waived with two Intellectual Exploration courses earned in one General Education area.

* A student must be a matriculatated student at the University of Utah to have AP credit recorded. AP scores and General Education waivers are evaluated according to the current policy at the time the request is made for an evaluation.

ADMISSIONS OFFICE 831: Effective September 30, 2007 (Spring 2007 for Writing)
Subject to change without notice