## University Core and Graduation Requirements

### University Core Requirements:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>#Classes</th>
<th>Hours</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Religion Cornerstones</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
<td></td>
<td></td>
<td>REL A 275</td>
</tr>
<tr>
<td>Jesus Christ and the Everlasting Gospel</td>
<td></td>
<td></td>
<td>REL A 250</td>
</tr>
<tr>
<td>Foundations of the Restoration</td>
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<td>REL C 225</td>
</tr>
<tr>
<td>The Eternal Family</td>
<td></td>
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<td>REL C 200</td>
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<tr>
<td>The Individual and Society</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>American Heritage</td>
<td>1-2</td>
<td>3-6.0</td>
<td>from approved list*</td>
</tr>
<tr>
<td>Global and Cultural Awareness</td>
<td>1</td>
<td>3.0</td>
<td>from approved list*</td>
</tr>
<tr>
<td>Skills</td>
<td></td>
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<tr>
<td>First Year Writing</td>
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<tr>
<td>Advanced Written and Oral Communications</td>
<td></td>
<td>1</td>
<td>WRTG 316</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td></td>
<td>1</td>
<td>MATH 112 or MATH 113</td>
</tr>
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<td>Languages of Learning (Math or Language)</td>
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<td>1</td>
<td>MATH 112</td>
</tr>
<tr>
<td>Arts, Letters, and Sciences</td>
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</tr>
<tr>
<td>Civilization 1</td>
<td></td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Civilization 2</td>
<td></td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Arts</td>
<td></td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Letters</td>
<td></td>
<td>1</td>
<td>3.0</td>
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<tr>
<td>Biological Science</td>
<td></td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Physical Science</td>
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<td>2</td>
<td>CHEM 105 or 111, and PHSCS 121</td>
</tr>
<tr>
<td>Social Science</td>
<td></td>
<td>1</td>
<td>ECON 110</td>
</tr>
<tr>
<td>Core Enrichment: Electives</td>
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<td></td>
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<tr>
<td>Religion Electives</td>
<td>3-4</td>
<td>6.0</td>
<td>from approved list**</td>
</tr>
<tr>
<td>Open Electives</td>
<td></td>
<td></td>
<td>Variable Variable personal choice</td>
</tr>
</tbody>
</table>

*American Heritage can be satisfied by taking A HTG 110, ECON 110 + HIST 220, or ECON 110 + POLI 110. Since ECON 110 is required for the major, students may take HIST 220, POLI 110, or A HTG 110 to satisfy the American Heritage requirement.

*REDUCTION OF TOTAL CREDITS IS RECOMMENDED by choosing a Civilization 2 course that double counts for the Arts requirement (Civ 2/Art) and a Letters course the double counts for the Global and Cultural Awareness requirement (Lett/GCA). (You may also do a Civ 2/Lett + Art/SCA pairing.) See the University Core list for specifics (core.byu.edu).

**The department Biology requirement may be satisfied by taking one of the following courses: BIO 100, BIO 130, MMBIO 221, MMBIO 240, or PDBIO 120. Each of these also satisfies the University Core requirement for Biological Sciences. BIO 100 is introductory in nature and is not recommended for students who had any biology in high school. See the department website for more information.

### Suggested Sequence of Courses

#### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>1st Semester</th>
<th>2nd Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRTG 150</td>
<td>American Heritage</td>
</tr>
<tr>
<td>CH EN 170</td>
<td>PHSCS 121</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>CHEM 112</td>
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<tr>
<td>MATH 112</td>
<td>MATH 113</td>
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<tr>
<td>CH EN 191</td>
<td>ECON 110</td>
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<tr>
<td>Religion Cornerstone course</td>
<td>RELATION elective</td>
</tr>
<tr>
<td>Total Hours</td>
<td>Total Hours</td>
</tr>
<tr>
<td>15.5</td>
<td>16.0</td>
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#### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>3rd Semester</th>
<th>4th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH EN 263</td>
<td>CH EN 273</td>
</tr>
<tr>
<td>CH EN 291</td>
<td>CHEM 307</td>
</tr>
<tr>
<td>CHEM 302</td>
<td>MATH 302</td>
</tr>
<tr>
<td>STAT 201</td>
<td>STAT 201</td>
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<tr>
<td>Religion Cornerstone course</td>
<td>Religion elective</td>
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<tr>
<td>Total Hours</td>
<td>Total Hours</td>
</tr>
<tr>
<td>17.5</td>
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#### JUNIOR YEAR

<table>
<thead>
<tr>
<th>5th Semester</th>
<th>6th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH EN 374</td>
<td>CH EN 379</td>
</tr>
<tr>
<td>CH EN 311</td>
<td>CHEM Lab elective</td>
</tr>
<tr>
<td>CH EN 285</td>
<td>MATH 303</td>
</tr>
<tr>
<td>Biological Science course**</td>
<td>Religion Cornerstone course</td>
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<tr>
<td>Total Hours</td>
<td>Total Hours</td>
</tr>
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<td>17.5</td>
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#### SENIOR YEAR

<table>
<thead>
<tr>
<th>7th Semester</th>
<th>8th Semester</th>
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<tbody>
<tr>
<td>CH EN 378</td>
<td>CHEN 451</td>
</tr>
<tr>
<td>CH EN 386</td>
<td>EPSEL elective</td>
</tr>
<tr>
<td>CHEM 345</td>
<td>Engineering elective</td>
</tr>
<tr>
<td>CH EN 391</td>
<td>Engineering elective</td>
</tr>
<tr>
<td>CHEM 467</td>
<td>Religion elective</td>
</tr>
<tr>
<td>Civilization 2/Arts course</td>
<td>Civilizations course</td>
</tr>
<tr>
<td>Total Hours</td>
<td>Total Hours</td>
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<tr>
<td>17.5</td>
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#### Senior Year

<table>
<thead>
<tr>
<th>9th Semester</th>
<th>10th Semester</th>
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<tr>
<td>CH EN 451</td>
<td>CHEM 451</td>
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<tr>
<td>EPSEL elective</td>
<td>Engineering elective</td>
</tr>
<tr>
<td>Religion elective</td>
<td>Letters/GCA elective</td>
</tr>
<tr>
<td>Total Hours</td>
<td>Total Hours</td>
</tr>
<tr>
<td>17.5</td>
<td>17.5</td>
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</tbody>
</table>

For students entering the degree program during the 2020-2021 curricular year.
Due to the complex prerequisite relationships and limited sizing of these courses, students should consult with the department about their course scheduling.

REQUIREMENT 1: Complete 9 courses

PREPROFESSIONAL COURSES:

OPTION 1.1: Complete 2 courses
- CH EN 170: Introduction to Chemical Engineering
- CH EN 191: Preprofessional Seminar

OPTION 1.2: Complete 4 courses
- CH EN 263: Computational Tools for Chemical Engineers
- CH EN 273: Chemical Process Principles
- CH EN 291: Career Skills
- CH EN 436: Process Control and Dynamics

OPTION 1.3: Complete 3 courses
- EC EN 301: Elements of Electrical Engineering
- PHSCS 121: Introduction to Newtonian Mechanics
- MATH 113: Calculus 2

PREPROFESSIONAL COURSES:

GROUP 1.1.

GROUP 1.2.

GROUP 1.3.

OPTION 1.4: Complete 3 options

PREPROFESSIONAL COURSES:

GROUP 1.4.

OPTION 2.1: Complete 2 courses
- MATH 112: Calculus 1
- MATH 113: Calculus 2

OPTION 2.2: Complete 2 selections

SELECTION 1.1: Complete 1 course
- MATH 213: Elementary Linear Algebra

SELECTION 1.2: Complete 2 courses
- MATH 314: Calculus of Several Variables
- MATH 334: Ordinary Differential Equations

OPTION 2.3: Complete 3 options

PREPROFESSIONAL COURSES:

GROUP 2.1.

GROUP 2.2.

GROUP 2.3.

GROUP 2.4.

OPTION 3.1: Complete 2 courses
- CHEM 107: General College Chemistry 2
- CHEM 106: General College Chemistry 1

OPTION 3.2: Complete 3 courses
- CHEM 111: Organic Chemistry Laboratory--Nonmajors
- PHYSCS 211: Physical Chemistry Laboratory 1
- PHYSCS 212: Physical Chemistry Laboratory 2

OPTION 3.3: Complete 4 options

PREPROFESSIONAL COURSES:

GROUP 3.1.

GROUP 3.2.

GROUP 3.3.

OPTION 4.1: Complete 2.0 hours from the following course(s)

A. CHEMISTRY LABORATORY:
- CHEM 353: Organic Chemistry Laboratory--Nonmajors
- CHEM 465: General Chemistry Laboratory

OPTION 4.2: Complete 9 hours of approved advanced engineering (ENG) coursework.

B. Complete 9 hours of approved advanced engineering (ENG) coursework.

OPTION 4.3: Complete 4 hours of approved advanced course work from an engineering, math, science, or business (EMSB) department.

PREPROFESSIONAL COURSES:

GROUP 4.1.

GROUP 4.2.

GROUP 4.3.

OPTION 5.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 5.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 5.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

OPTION 5.4: Complete 1 course
- CH EN 496: Separations

PREPROFESSIONAL COURSES:

GROUP 5.1.

GROUP 5.2.

GROUP 5.3.

OPTION 6.1: Complete 4.0 hours from the following course(s)

A. CHEMISTRY LABORATORY:
- CHEM 105: General College Chemistry 1
- CHEM 112: General College Chemistry 2

B. Complete 4.0 hours from the following course(s)

OPTION 6.2: Complete 9 hours of approved advanced engineering (ENG) coursework.

C. Complete 9 hours of approved advanced engineering (ENG) coursework.

OPTION 6.3: Complete 4 hours of approved advanced course work from an engineering, math, science, or business (EMSB) department.

PREPROFESSIONAL COURSES:

GROUP 6.1.

GROUP 6.2.

GROUP 6.3.

OPTION 7.1: Complete 2 courses
- CH EN 377: Chemical Engineering Thermodynamics
- MATH 213: Elementary Linear Algebra

OPTION 7.2: Complete 3 courses
- CH EN 345: Materials and Reactions Lab
- MATH 385: Thermodynamics and Transport Lab
- MATH 386: Chemical Reaction Engineering

OPTION 7.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 7.1.

GROUP 7.2.

GROUP 7.3.

OPTION 8.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 8.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 8.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 8.1.

GROUP 8.2.

GROUP 8.3.

OPTION 9.1: Complete 4.0 hours from the following course(s)

A. CHEMISTRY LABORATORY:
- CHEM 105: General College Chemistry 1
- CHEM 112: General College Chemistry 2

B. Complete 4.0 hours from the following course(s)

OPTION 9.2: Complete 9 hours of approved advanced engineering (ENG) coursework.

C. Complete 9 hours of approved advanced engineering (ENG) coursework.

OPTION 9.3: Complete 4 hours of approved advanced course work from an engineering, math, science, or business (EMSB) department.

PREPROFESSIONAL COURSES:

GROUP 9.1.

GROUP 9.2.

GROUP 9.3.

OPTION 10.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 10.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 10.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 10.1.

GROUP 10.2.

GROUP 10.3.

OPTION 11.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 11.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 11.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 11.1.

GROUP 11.2.

GROUP 11.3.

OPTION 12.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 12.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 12.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 12.1.

GROUP 12.2.

GROUP 12.3.

OPTION 13.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 13.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 13.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 13.1.

GROUP 13.2.

GROUP 13.3.

OPTION 14.1: Complete 2.0 hours from the following course(s)

A. CHEMISTRY LABORATORY:
- CHEM 353: Organic Chemistry Laboratory--Nonmajors
- CHEM 465: General Chemistry Laboratory

OPTION 14.2: Complete 9 hours of approved advanced engineering (ENG) coursework.

B. Complete 9 hours of approved advanced engineering (ENG) coursework.

OPTION 14.3: Complete 4 hours of approved advanced course work from an engineering, math, science, or business (EMSB) department.

PREPROFESSIONAL COURSES:

GROUP 14.1.

GROUP 14.2.

GROUP 14.3.

OPTION 15.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 15.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 15.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 15.1.

GROUP 15.2.

GROUP 15.3.

OPTION 16.1: Complete 2 courses
- CH EN 374: Fluid Mechanics
- MATH 385: Thermodynamics and Transport Lab

OPTION 16.2: Complete 3 courses
- CH EN 376: Heat and Mass Transfer
- CH EN 385: Chemical Reaction Engineering
- CH EN 386: Chemical Process Design and Process Synthesis

OPTION 16.3: Complete 2 courses
- CH EN 391: Career Skills
- CH EN 445: Separations and Process Control Lab

PREPROFESSIONAL COURSES:

GROUP 16.1.

GROUP 16.2.

GROUP 16.3.
BS in Chemical Engineering (392150)
2020-2021

are engaged in developing and producing a diverse range of products from raw materials to commodity and specialty chemicals. These products include high-performance materials needed for aerospace, automotive, biomedical, electronic, environmental and military applications. Chemical engineers work in a variety of industries, including chemical manufacturing, energy, biotechnology, electronics, food, clothing, paper, healthcare, and business services.

PROFESSIONAL PROGRAM ADMISSION POLICY:
Admission to the professional program is available to all students in good academic standing with the university who have (a) passed the prerequisite courses for the first-semester professional courses, namely CH EN 273 and MATH 302, and (b) submitted to the department an Application for the Chemical Engineering Professional Program. The Application for the Chemical Engineering Professional Program requires students to meet with their department advisor for direction and counseling with regard to performance in the preprofessional program courses and successful completion of the professional program.

ACADEMIC STANDARDS POLICY:
To help students 1) identify if chemical engineering is a good academic fit, 2) successfully complete the chemical engineering program, and 3) become technically competent engineers capable of performing professional duties in the field, the department has set the academic standards enumerated below. For this policy, major courses are defined as those used to fulfill the Program Requirements listed for a BS in Chemical Engineering in the Undergraduate Catalog and are found under subheadings preprofessional, professional, supporting, and technical electives. Since all grades earned for a course (original and retakes) are retained in university records and GPA calculations, only the most recent grades for retaken courses are considered for purposes of this policy. Also, this policy only applies to those courses used to fulfill graduation requirements.

1. To ensure proper preparation for and successful completion of the chemical engineering program, students must meet the following criteria to register for any upper-division professional courses (i.e. CH EN Courses 300 level and above): a) Have no more than 4 total hours of less than C- credit in any preprofessional or supporting course(s) satisfying program requirements, only 3 of which can be from chemical engineering courses. b) Pass CH EN 273 with a C- or above.

2. To help correct technical weaknesses as soon as they are identified, a student who accumulates grades below C- in excess of 6 hours in any course(s) satisfying major requirements (preprofessional, professional, supporting, and technical electives) may not take further chemical engineering courses until the unacceptable credits have been reduced to 6 hours or less.

3. To demonstrate that graduates from the chemical engineering department are technically competent to perform professional duties in the field, a student may not graduate with more than 4 total hours below C- in any course(s) satisfying major requirements (preprofessional, professional, supporting, and technical electives), only 3 of which can be from chemical engineering.

RESEARCH:
The Department of Chemical Engineering has a highly qualified faculty with a wide range of experience in both industry and research. Many areas of research are being pursued, including: 1) converting coal to clean gaseous fuels; 2) combustion of coals and other fuels as well as rocket propellants; 3) developing new storage batteries; 4) measurement and prediction of physical, chemical, thermodynamic, and transport properties of liquids, gases, and solids; 5) molecular simulations; 6) chemical processes and materials in biological systems, including the human body; 7) catalysis, with emphasis on forming and reforming hydrocarbon fuels; 8) computer control of chemical processes; 9) sustainable energy; and 10) mathematical modeling of chemical processes and phenomena.

INTERNSHIPS, CO-OP EDUCATION:
Encouraged.

HONORARY SOCIETIES AND CLUBS:
American Institute of Chemical Engineers (AIChE), Sigma Xi, Tau Beta Pi.

FINANCING OF EDUCATION:
Scholarships, research assistantships, and teaching assistantships are available.

CAREER OPPORTUNITIES:
The combination of knowledge about process engineering, math, and chemistry obtained in the chemical engineering curriculum is a versatile preparation that opens a wide variety of opportunities to graduates. This versatility is one reason why chemical engineers have traditionally been among the highest paid professionals in the engineering and science disciplines.

Chemical engineers make a significant difference in our quality of life. Some develop clean, new energy sources to power society. Some develop and produce fertilizers and other agricultural chemicals to feed mankind. Virtually all pharmaceuticals are produced by chemical engineers to enhance the life of millions. Others study and produce biomedical devices and artificial organs. Still others are involved in development and production of new materials for use in new high-tech products.

Chemical engineers produce chemicals ranging in use from cleaning products to medicines and from man-made fibers for clothing and textiles to plastics for construction and consumer goods. Another large employer of chemical engineers is the semiconductor industry. Chemical engineers assist in the design and manufacturing of semiconductor chips and circuit boards. This work involves significant knowledge of chemistry and related processes. The petroleum industry is a large employer of chemical engineers, requiring their expertise for the discovery, production, and refining of petro-chemicals including fuels, chemicals, and oils. Many chemical engineers are employed in environmentally related positions, working on ways to improve air and water quality, to reduce acid rain and smog, and to recycle and reduce garbage. Additionally, chemical engineers are employed by universities as teachers and researchers and by government agencies to provide answers for energy, environmental, and defense concerns. Chemical engineers also train to work in the medical, business, and legal professions.

Though chemical engineering career opportunities are diverse, job functions can be categorized more easily. Chemical engineers are usually involved in research, design, development, production, technical sales, or management. In research, they develop new ideas, new products, and new ways to produce existing products more economically and with less environmental impact. In design, they create the processes that
convert raw materials into finished products with emphasis on efficiency, safety, consumer needs, and environmental protection. The development engineer improves existing processes and technology to better meet changing needs. Production engineering involves supervision, quality control, and testing of production processes and operations. Management and technical sales involve decision making with regard to consumer needs and technical capabilities. Chemical engineers are creative problem solvers. Their careers are rewarding not only from an intellectual and financial view, but also from a personal perspective. Affecting the lives of millions, their solutions provides a better lifestyle for mankind.

MAP DISCLAIMER
While every reasonable effort is made to ensure accuracy, there are some student populations that could have exceptions to listed requirements. Please refer to the university catalog and your college advisement center/department for complete guidelines.

DEPARTMENT INFORMATION
Chemical Engineering
Brigham Young University
330 Engineering Building
Provo, UT 84602
Telephone: 801-422-2586

ADVISEMENT CENTER INFORMATION
Engineering Advisement Center
Brigham Young University
246 Engineering Building
Provo, UT 84602
Telephone: 801-422-4325
Email: engineering_advisement@byu.edu