### 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>1</td>
<td>2.0</td>
<td>REL A 275</td>
</tr>
<tr>
<td>Jesus Christ and the Everlasting Gospel</td>
<td>1</td>
<td>2.0</td>
<td>REL A 250</td>
</tr>
<tr>
<td>Foundations of the Restoration</td>
<td>1</td>
<td>2.0</td>
<td>REL C 225</td>
</tr>
<tr>
<td>The Eternal Family</td>
<td>1</td>
<td>2.0</td>
<td>REL C 200</td>
</tr>
<tr>
<td>The Individual and Society</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Heritage</td>
<td>1-2</td>
<td>3.0-6.0</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>
<td></td>
<td></td>
</tr>
<tr>
<td>First Year Writing</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Advanced Written and Oral Communications</td>
<td>1</td>
<td>3.0</td>
<td>WRTG 316</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>1</td>
<td>4.0</td>
<td>MATH 112 or MATH 113</td>
</tr>
<tr>
<td>Languages of Learning (Math or Language)</td>
<td>1</td>
<td>4.0</td>
<td>MATH 112</td>
</tr>
<tr>
<td>Arts, Letters, and Sciences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civilization 1</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Civilization 2</td>
<td>1</td>
<td>3.0</td>
<td>from approved list*</td>
</tr>
<tr>
<td>Arts</td>
<td>1</td>
<td>3.0</td>
<td>from approved list*</td>
</tr>
<tr>
<td>Letters</td>
<td>1</td>
<td>3.0</td>
<td>from approved list*</td>
</tr>
<tr>
<td>Biological Science</td>
<td>1</td>
<td>3.0</td>
<td>from approved list**</td>
</tr>
<tr>
<td>Physical Science</td>
<td>2</td>
<td>7.0</td>
<td>CHEM 105 or 111, and PHSCS 121</td>
</tr>
<tr>
<td>Social Science</td>
<td>1</td>
<td>3.0</td>
<td>ECON 110</td>
</tr>
<tr>
<td>Core Enrichment: Electives</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 that double counts for the Global and Cultural Awareness requirement (Lett/GCA). (You may also do a Civ 2/Lett + Art/GCA 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>3.0</td>
</tr>
<tr>
<td>CH EN 170</td>
<td>2.0</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>4.0</td>
</tr>
<tr>
<td>MATH 112</td>
<td>4.0</td>
</tr>
<tr>
<td>CH EN 181</td>
<td>0.5</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2.0</td>
</tr>
<tr>
<td>Total Hours</td>
<td>15.5</td>
</tr>
</tbody>
</table>

#### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>3rd Semester</th>
<th>4th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH EN 263</td>
<td>2.0</td>
</tr>
<tr>
<td>CH EN 273</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEM 201</td>
<td>0.5</td>
</tr>
<tr>
<td>MATH 302</td>
<td>4.0</td>
</tr>
<tr>
<td>STAT 201</td>
<td>3.0</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2.0</td>
</tr>
<tr>
<td>Total Hours</td>
<td>17.5</td>
</tr>
</tbody>
</table>

#### JUNIOR YEAR

<table>
<thead>
<tr>
<th>5th Semester</th>
<th>6th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH EN 374</td>
<td>3.0</td>
</tr>
<tr>
<td>CH EN 285</td>
<td>0.5</td>
</tr>
<tr>
<td>CHEM Lab elective</td>
<td>2.0</td>
</tr>
<tr>
<td>MATH 303</td>
<td>4.0</td>
</tr>
<tr>
<td>Biological Science course**</td>
<td>3.0</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2.0</td>
</tr>
<tr>
<td>Total Hours</td>
<td>17.5</td>
</tr>
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</table>

#### SENIOR YEAR

<table>
<thead>
<tr>
<th>7th Semester</th>
<th>8th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH EN 378</td>
<td>3.0</td>
</tr>
<tr>
<td>CH EN 386</td>
<td>3.0</td>
</tr>
<tr>
<td>CH EN 345</td>
<td>0.5</td>
</tr>
<tr>
<td>Engineering elective</td>
<td>4.0</td>
</tr>
<tr>
<td>Total Hours</td>
<td>17.5</td>
</tr>
</tbody>
</table>

#### Graduation Requirements:

- Minimum residence hours required: 30.0
- Minimum hours needed to graduate: 120.0

### BS in Chemical Engineering (392150) MAP Sheet

Engineering, Chemical Engineering
For students entering the degree program during the 2022-2023 curricular year.
## BS in Chemical Engineering (392150)
### 2022-2023 Program Requirements (102.5 - 103.5 Credit Hours)

### Due to the complex prerequisite relationships and limited scheduling of these courses, students should consult with the department about their course scheduling.

#### REQUIREMENT 1 Complete 3 options

**PREPROFESSIONAL COURSES:**

**OPTION 1.1 Complete 9 courses**
- CH EN 170 - Introduction to Chemical Engineering
- CH EN 191 - Preprofessional Seminar
- CH EN 263 - Computational Tools for Chemical Engineers
- CH EN 273 - Chemical Process Principles
- CH EN 291 - Career Skills 1
- *MATH 112 - Calculus 1
- MATH 113 - Calculus 2
- PHHSC 121 - Introduction to Newtonian Mechanics
- STAT 201 - Statistics for Engineers and Scientists

**OPTION 1.2 Complete 1 group**

- **GROUP 1.2.1 Complete 2 courses**
  - CHEM 111 - Principles of Chemistry 1
  - CHEM 112 - Principles of Chemistry 2

- **GROUP 1.2.2 Complete 3 courses**
  - CHEM 105 - General College Chemistry 1 with Lab (Integrated)
  - CHEM 106 - General College Chemistry 2
  - CHEM 107 - General College Chemistry Laboratory

**OPTION 1.3 Complete 1 group**

- **GROUP 1.3.1 Complete 2 courses**
  - MATH 302 - Mathematics for Engineering 1
  - MATH 303 - Mathematics for Engineering 2

- **GROUP 1.3.2 Complete 2 selections**
  - **SELECTION 1.3.2.1 Complete 1 course**
    - MATH 213 - Elementary Linear Algebra
  - **SELECTION 1.3.2.2 Complete 2 courses**
    - MATH 314 - Calculus of Several Variables
    - MATH 334 - Ordinary Differential Equations

**PROFESSIONAL COURSES:**

- CH EN 374 - Fluid Mechanics
- CH EN 376 - Heat and Mass Transfer
- CH EN 378 - Science of Engineering Materials
- CH EN 385 - Thermodynamics and Transport Lab
- CH EN 386 - Chemical Reaction Engineering
- CH EN 391 - Career Skills 2
- CH EN 446 - Process Control and Dynamics
- CH EN 447 - Separations and Process Control Lab
- CH EN 451 - Chemical Engineering Plant Design and Process Synthesis
- CH EN 476 - Separations
- CH EN 479 - Unit Operations Laboratory

**REQUIREMENT 2 Complete 15 courses**

- **GROUP 1.4.1 Complete 2 electives**
  - CHEM 351 - Organic Chemistry Laboratory – Nonmajors
  - CHEM 464 - Physical Chemistry Laboratory 1
  - CHEM 465 - Physical Chemistry Laboratory 2

- **GROUP 1.4.2 Complete 2 technical electives (15 hours minimum) satisfying the following requirements:**
  - **OPTION 4.1 Complete 2.0 hours from the following course(s)**
    - CHEM 110 - Introduction to Chemistry
  - **OPTION 4.2 Complete 9 hours of approved advanced engineering (ENG) course work.**
    - In general, these courses are 300-level or above from any of the following departments: Chemical Engineering; Civil & Environmental Engineering; Electrical & Computer Engineering; Mechanical Engineering; or the School of Technology. For details and exceptions, see the department webpage.

**REQUIREMENT 3 Complete 6 courses**

**SUPPORTING COURSES. NOTE: ECON 110 IS REQUIRED FOR THE MAJOR. SEE DEPARTMENT ADVISOR FOR MAJOR REQUIREMENTS.**

- BID 100 - Principles of Biology
- CHEM 357 - Industrial Organic Chemistry
- CHEM 467 - Physical Chemistry for Engineers
- EC EN 301 - Elements of Electrical Engineering
- *ECON 110 - Economic Principles and Problems
- *WRTG 316 - Technical Communication

**REQUIREMENT 4 Complete 5 options**

**COMPLETE TECHNICAL ELECTIVES (15 HOURS MINIMUM) SATISFYING THE FOLLOWING REQUIREMENTS:**

- **OPTION 4.1 Complete 2.0 hours from the following course(s)**
  - A. CHEMISTRY LABORATORY. NOTE: THE CHEMICAL ENGINEERING DEPARTMENT REQUIRES 2 CREDIT OF ORGANIC CHEMISTRY LAB. SEE CHEMICAL ENGINEERING DEPARTMENT ADVISOR FOR QUESTIONS.
  - CHEM 353 - Organic Chemistry Laboratory – Nonmajors
  - CHEM 464 - Physical Chemistry Laboratory 1
  - CHEM 465 - Physical Chemistry Laboratory 2

**OPTION 4.2 Complete 9 hours of approved advanced engineering (ENG) course work.**

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

**OPTION 4.4 Complete 2022-2023 Program Requirements (102.5 - 103.5 Credit Hours)**

**REQUIRED 5 Complete 3 options**

**COMPLETE TECHNICAL ELECTIVES (15 HOURS MINIMUM) SATISFYING THE FOLLOWING REQUIREMENTS:**

- **OPTION 4.1 Complete 2.0 hours from the following course(s)**
  - CHEM 351 - Organic Chemistry Laboratory – Nonmajors
  - CHEM 464 - Physical Chemistry Laboratory 1
  - CHEM 465 - Physical Chemistry Laboratory 2

**REQUIREMENT 5 Pass a basic competency exam (L3 exam) administered by the Chemical Engineering Department or pass the FE (fundamentals of engineering) exam.**

**THE DISCIPLINE:**

Chemical engineering is the application of chemistry, biology, physics, mathematics, computer skills, and economics to designing, developing, and implementing chemical processes that convert raw materials into more useful, valuable products. Engineering skills are required for design, testing, scale-up, operation, control, and optimization. Applications range in size from the molecular level to large chemical production facilities, with objectives ranging from economic performance to protection of the environment and the safety of workers and consumers. Chemical engineers 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.
BS in Chemical Engineering (392150)  
2022-2023

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 coal 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

BS in Chemical Engineering (392150)
2022-2023