This ChE Student Handbook does not supersede information found on the UMD web pages or published catalogues.

24 August 2015 Edition
Welcome to the Department of Chemical Engineering (ChE) at the University of Minnesota Duluth (UMD). Your goal is to earn a professional degree baccalaureate of science in chemical engineering (B.S.Ch.E.). We will make every effort to help you along your way; however, it is essential to recognize that Chemical Engineering is a rewarding as well as demanding profession, both intellectually and technically. This is necessarily reflected in the undergraduate curriculum, particularly in years three and four (upper division professional program).

Initially declaring chemical engineering as a major, and merely passing courses, does not guarantee that you will graduate with a degree in chemical engineering. You will be required to apply for admission to the upper division professional program (see Section 3.3) after about two years, whereby your ability to meet the demands of our advanced courses will be assessed.

The department has a faculty and staff dedicated to student learning and success. Most department, faculty, and staff offices and labs are located in the Engineering Building on the UMD campus.

<table>
<thead>
<tr>
<th>Address</th>
<th>Phone: (218) 726-7126</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fax: (218) 726-6907</td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:umdche@d.umn.edu">umdche@d.umn.edu</a></td>
</tr>
<tr>
<td></td>
<td>Web: <a href="http://www.d.umn.edu/che">www.d.umn.edu/che</a></td>
</tr>
</tbody>
</table>
The *Che Student Handbook* contains important information on department policies, people, programs, activities, traditions, organization, resources, etc. The Che Department reserves the right to alter or eliminate any policies or content of this handbook at any time. This information does not supersede policy and procedure of the University of Minnesota Duluth, provided at [www.d.umn.edu](http://www.d.umn.edu).

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1 Introduction to Chemical Engineering

1.1 Our Vision
The Department of Chemical Engineering at UMD strives for nationally recognized excellence in engineering education and research by using modern, hands-on, and active learning experiences to prepare undergraduate students for professional success, and to hold paramount the safety, health and welfare of the public, and to protect the environment in performance of their professional duties.

1.2 Our Mission and Educational Objectives
The Department of Chemical Engineering at UMD produces engineers with a strong foundation of technical, communication, teamwork, and problem-solving skills required for professional success, who:

1. Pursue careers where they apply their engineering and problem solving skills.
2. Pursue advanced studies or other forms of continuing education.
3. Value their UMD chemical engineering education and endorse the program and its students.

1.3 Student Outcomes
The Chemical Engineering Department will produce graduates that have:

a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multidisciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

1.4 Your Responsibility
Chemical Engineering is a rigorous, intellectually, and technically demanding discipline. Your aim is to learn modern skills, not just trade performance for a grade. We provide a student learner-centered environment that gives you the tools to take responsibility for your own learning. For additional information go to www.d.umn.edu/vcaa/TeachingLearning.html
2 UMD & SCSE Admission Requirements
New and transfer students that meet the minimum standards for admission to UMD and the Swenson College of Science and Engineering may elect to major in Chemical Engineering as program space allows (www.d.umn.edu/admissions/).

2.1 High School Preparation Requirements
All students are required to submit official high school transcripts showing completion or progress toward completion of a minimum of the following courses:

1. **ENGLISH** - Four years, including writing, literature, and speech.
2. **MATHEMATICS** - Three years consisting of two years of algebra, one of which must be intermediate or advanced algebra, and one year of geometry. **NOTE:** Beginning with students who apply for Fall 2015 admission, four years of math will be required for all applicants.
3. **SCIENCE** - Three years, including at least one course each in the biological and physical sciences, and all three units to incorporate significant laboratory experience.
4. **SOCIAL STUDIES** - Three years, including one year each of geography and American history. Geography need not always be taught as a full year course, and may in fact be incorporated in a significant way into other studies; transcripts should indicate specifically which courses meet the geography requirement.
5. **WORLD LANGUAGE** - Two years of a single second language.
6. **ARTS** - One year in the visual or performing arts including instruction in the history and critical interpretation of the art form.

See (http://www.d.umn.edu/admissions/requirements.html) for detailed information about admission requirements.

2.2 Automatic Admission to UMD SCSE
Automatic admission is on a rolling basis beginning September 15 for students meeting all high school preparation requirements and one of the following combinations of criteria:

- High School GPA ≥ 3.4 and ACT Math subscore ≥ 21, or
- High School GPA ≥ 3.2 and ACT English subscore ≥ 25 and ACT Math subscore ≥ 21, or

2.3 Admission Review
Applications from students not meeting the automatic admission criteria are reviewed after the December 15 priority deadline until August 1 with priority given to students with the highest high school GPA. Admission decisions are based on:

- ACT/SAT scores
- High school grades in specific courses (e.g., math, science, etc.)
- Grade trends
- Rigor of academic curriculum (e.g., AP courses)
- College level coursework completed through PSEO and CITS
- Letter of intent and letters of recommendation
- Special status, such as first-generation or non-traditional student, military status, etc.
3 B.S.Ch.E. Degree Requirements

Students may declare a chemical engineering major as freshmen or sophomore lower division students, but must demonstrate adequate preparation before being allowed to register for upper division chemical engineering courses at the ChE 31XX level and higher.

3.1 Typical Program of Study

The following table shows a typical 4-year schedule for students beginning in Math 1296 Calculus I:

- ChE 1011 Introduction to Chemical Engineering requires Math 1296 Calculus I as a pre- or co-requisite course. (Students may substitute ChE 2001 Introduction to Environmental Engineering for ChE 1011).
- Transfer students with 36 or more credits and completion of one year of general chemistry and one year of calculus must take an additional 2xxx or higher engineering elective of 3 credits or more in place of ChE 1011, subject to department approval.
- Calculus requires an ACT Math subscore ≥ 27 or UMD Precalc. Students can take CLEP test for Precalc if they are not happy with math placement. (http://clep.collegeboard.org/)
- Individual schedules may vary depending on the number of credits transferred to UMD and the number of credits completed each semester. Work with your academic adviser to plan for any potential changes due to summer course work, transfer credits, study-abroad, or Coop.
- Options for science or engineering technical electives allow students to tailor the program to their specific areas of interest and flexibility to accommodate coops and study abroad.
- Complete at least eight credits of advanced chemistry in addition to Chem 2541 and 2543. Courses must be CHEM 2xxx (or higher) and may not be satisfied with CHEM 4184, 4185, 4634, or 5350.
- Complete at least 10 credits of science or engineering electives, subject to department approval. Technical electives must be 2xxx or higher; only one 2xxx course is allowed (Biol 1011 Gen. Bio I may be used for the 2xxx technical elective); at least one course must be 4xxx or higher; maximum of three credits of Coop and internship credits allowed; may not be used to satisfy advanced chemistry elective requirements. The following courses are not approved for ChE Science or Engineering technical electives.

<table>
<thead>
<tr>
<th>AIR = none allowed</th>
<th>IE 4993</th>
</tr>
</thead>
</table>
Biol 2512, 2763, 3501, 3802, 3987, 3993, 4992, 5001 | Math 3120, 3941 |
Chem 4184, 4185, 4634, 5350 | ME 2105, 3111, 4112 |
CS 3111, 4993 | Phys 2199, 4110 |
Geol 3180, 4180, 5100 |

- Complete at least three credits of advanced writing at the WRIT 31XX level (or higher).
- Complete at UMD at least half of the 3xxx and higher courses required for the degree. Study-abroad credits earned through courses taught by UM faculty and at institutions with which UMD has international exchange programs may be used to fulfill this requirement.
- A 2.00 minimum GPA in all work attempted at UMD; 2.00 minimum GPA in all work, including transfer credits; successful completion of 75% of all work attempted.
- A 2.00 minimum GPA in all courses taken in the chemical engineering major, including required courses in related fields. The GPA requirement applies to all courses in the major taken at UMD calculated separately and to all courses in the major when transfer credits are included.
<table>
<thead>
<tr>
<th>Year 1 - Fall Semester</th>
<th>Cr</th>
<th>Year 1 - Spring Semester</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE 1011 Intro to ChE *</td>
<td>3</td>
<td>CS 1121 Intro to Visual Basic programming</td>
<td>3</td>
</tr>
<tr>
<td>Chem 1153 General Chemistry I</td>
<td>4</td>
<td>Chem 1155 General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>Chem 1154 General Chemistry Lab I</td>
<td>1</td>
<td>Chem 1156 General Chemistry Lab II</td>
<td>1</td>
</tr>
<tr>
<td>or 1161 Honors Gen Chem I (5 cr)</td>
<td>5</td>
<td>or 1162 Honors Gen Chem II (5 cr)</td>
<td>5</td>
</tr>
<tr>
<td>Math 1296 Calculus I</td>
<td>5</td>
<td>Math 1297 Calculus II</td>
<td>5</td>
</tr>
<tr>
<td>or 1596 Honors Calc I</td>
<td>5</td>
<td>or 1597 Honors Calc II</td>
<td>5</td>
</tr>
<tr>
<td>Writ 1120 College Writing</td>
<td>3</td>
<td>Phys 2013 General Physics I</td>
<td>4</td>
</tr>
<tr>
<td>or 1161 Honors Gen Chem I (5 cr)</td>
<td>5</td>
<td>or 2017 Honors General Physics</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2 - Fall Semester</th>
<th>Cr</th>
<th>Year 2 - Spring Semester</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE 2111 Material and Energy Balances</td>
<td>3</td>
<td>ChE 2121 ChE Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>Chem 2541 Organic Chemistry I</td>
<td>3</td>
<td>ChE 3031 Computational Methods in ChE</td>
<td>3</td>
</tr>
<tr>
<td>Chem 2543 Organic Chemistry Lab 1</td>
<td>1</td>
<td>Chem 2XXX (or higher) Elective</td>
<td>3-4</td>
</tr>
<tr>
<td>Math 3280 Differential Equations</td>
<td>4</td>
<td>Science or Engineering 2XXX (or higher) Elective</td>
<td>3-4</td>
</tr>
<tr>
<td>Phys 2015 General Physics II</td>
<td>4</td>
<td>Liberal Education Elective**</td>
<td>3</td>
</tr>
<tr>
<td>Phys 2016 General Physics Lab II</td>
<td>1</td>
<td>Total</td>
<td>15-17</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3 - Fall Semester</th>
<th>Cr</th>
<th>Year 3 - Spring Semester</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE 2011 Design of Experiments</td>
<td>3</td>
<td>ChE 3112 Heat and Mass Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ChE 3111 Fluid Mechanics</td>
<td>3</td>
<td>ChE 3231 Properties of Engineering Materials</td>
<td>3</td>
</tr>
<tr>
<td>ChE 3241 Principles of Particle Tech</td>
<td>3</td>
<td>ChE 4402 Process Dynamics Control</td>
<td>3</td>
</tr>
<tr>
<td>or 4141 Material &amp; Mineral Process</td>
<td>3</td>
<td>Science or Engineering 3XXX (or higher) elective</td>
<td>3-4</td>
</tr>
<tr>
<td>Chem 2XXX (or higher) Chemistry elect</td>
<td>3-4</td>
<td>Liberal Education Elective**</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 31XX (or higher) Elective</td>
<td>3</td>
<td>Liberal Education Elective</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>15-16</td>
<td>Total</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4 - Fall Semester</th>
<th>Cr</th>
<th>Year 4 - Spring Semester</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE 3211 ChE Laboratory I</td>
<td>3</td>
<td>ChE 4211 ChE Laboratory II</td>
<td>3</td>
</tr>
<tr>
<td>ChE 4111 Separations</td>
<td>3</td>
<td>ChE 4502 ChE Design II</td>
<td>4</td>
</tr>
<tr>
<td>ChE 4301 Chemical Reaction Engr</td>
<td>3</td>
<td>Science or Engineering 4XXX (or higher) elective</td>
<td>3-4</td>
</tr>
<tr>
<td>ChE 4501 ChE Design I</td>
<td>4</td>
<td>Liberal Education Elective**</td>
<td>3</td>
</tr>
<tr>
<td>Liberal Education Elective**</td>
<td>3</td>
<td>Liberal Education Elective**</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>16-17</td>
</tr>
</tbody>
</table>

* ChE 2001 Introduction to Environmental Engineering may be substituted for ChE 1011. Transfer students must substitute an additional 2xxx (or higher) engineering elective for ChE 1011.

** You may complete Liberal Education Electives in any order.
### 3.2 Prerequisite Flow Chart

BSChE degree program courses build up from prerequisites (bottom to top, left to right).

<table>
<thead>
<tr>
<th>Lower Division Program</th>
<th>Upper Division Professional Program</th>
</tr>
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<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td><strong>Year 2</strong></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td><strong>Year 4</strong></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td><strong>Key</strong></td>
<td>ChE 4501: Design I (4) [coreq 4111, 4301]</td>
</tr>
<tr>
<td>( ) = Credits</td>
<td>ChE 4502: Design II (4) [4501, (coreq 3231, 4402)]</td>
</tr>
<tr>
<td>[ ] = Prereq</td>
<td></td>
</tr>
<tr>
<td>x = elective</td>
<td></td>
</tr>
<tr>
<td><strong>ChE 1011#</strong></td>
<td><strong>ChE 3031</strong></td>
</tr>
<tr>
<td>Intro to ChE (3)</td>
<td>Comp Meth (3) [2111, Math 3280, (coreq CS 1121)]</td>
</tr>
<tr>
<td>(coreq Chem 1153/4 and</td>
<td></td>
</tr>
<tr>
<td>Math 1296)]</td>
<td></td>
</tr>
<tr>
<td><strong>CS 1121 %</strong></td>
<td><strong>ChE 3111!</strong></td>
</tr>
<tr>
<td>Intro to Visual Basic</td>
<td>Fluids (3) [Math 3280, (coreq ChE 2111), Phys 2013/4]</td>
</tr>
<tr>
<td>(3) [HS Algebra]</td>
<td></td>
</tr>
<tr>
<td><strong>ChE 2111</strong></td>
<td><strong>ChE 3111!</strong></td>
</tr>
<tr>
<td>Material &amp; Energy Bal</td>
<td>Heat &amp; Mass Transfer (3) [3111, (coreq 2121)]</td>
</tr>
<tr>
<td>(3) [Chem 1153/4, Math</td>
<td></td>
</tr>
<tr>
<td>1296]</td>
<td></td>
</tr>
<tr>
<td><strong>ChE 2121</strong></td>
<td><strong>ChE 3111!</strong></td>
</tr>
<tr>
<td>Thermo (3) [2111, and</td>
<td>Heat &amp; Mass Transfer (3) [3111, (coreq 2121)]</td>
</tr>
<tr>
<td>(coreq Math 3280)]</td>
<td></td>
</tr>
<tr>
<td><strong>ChE 2011</strong></td>
<td><strong>ChE 3321</strong></td>
</tr>
<tr>
<td>DoE (3) [Math 1297,</td>
<td>Materials (3) [2121, Chem 1152]</td>
</tr>
<tr>
<td>(coreq ChE 2111)]</td>
<td></td>
</tr>
<tr>
<td><strong>Writ 1120</strong></td>
<td><strong>Phys 2015/6</strong></td>
</tr>
<tr>
<td>College Writing (3)</td>
<td>Physics II and Lab (5) [2013/4]</td>
</tr>
<tr>
<td>(any time first two</td>
<td></td>
</tr>
<tr>
<td>years)</td>
<td></td>
</tr>
<tr>
<td><strong>Math 1296</strong></td>
<td><strong>Math 3280</strong></td>
</tr>
<tr>
<td>Calculus I (5) [Math</td>
<td>Diff Eq (4) [1297]</td>
</tr>
<tr>
<td>ACT 27]</td>
<td></td>
</tr>
<tr>
<td><strong>Chem 1153, 1154</strong></td>
<td><strong>Chem 1155, 1156</strong></td>
</tr>
<tr>
<td>Gen Chem I and Lab(4)</td>
<td>Gen Chem II and Lab (4) [1151 or 1153]</td>
</tr>
<tr>
<td>[1 yr HS Chem, ACT</td>
<td></td>
</tr>
<tr>
<td>Math 21]</td>
<td><strong>1xxx+ Liberal Ed Elective (3)</strong></td>
</tr>
<tr>
<td>**1xxx+ Liberal Ed</td>
<td><strong>1xxx+ Liberal Ed Elective (3)</strong></td>
</tr>
<tr>
<td>Elective (3)</td>
<td><strong>1xxx+ Liberal Ed Elective (3)</strong></td>
</tr>
<tr>
<td>**1xxx+ Liberal Ed</td>
<td>**1xxx+ Liberal Ed Electives (6)</td>
</tr>
<tr>
<td>Electives (6)</td>
<td></td>
</tr>
</tbody>
</table>

# or ChE 2001 or 2xxx or higher engineering elective
* or Honors General Chemistry
** or Honors Calculus
*** or Honors Physics
+ or higher

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- May use ChE 3311 in place of 3111 and 3112
- ^ may not be satisfied with Chem 3184, 4184, 4632
- & or ChE 4141 Material and Mineral Processing
- % or CS 1411 Programming in Matlab,
- Other programming courses allowed, subject to department approval
3.3 Lower Division and Upper Division Professional Programs

Chemical Engineering at UMD is a professional degree program that requires admission to the upper division BSChE professional program before registering for ChE 3111 (or higher) level courses in Chemical Engineering. ChE majors are considered for admission to upper division based upon their GPA for the following courses:

<table>
<thead>
<tr>
<th>Program</th>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE</td>
<td>1011*</td>
<td>Introduction to ChE</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHE</td>
<td>2111**</td>
<td>Material &amp; Energy Balances</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHEM</td>
<td>1153*</td>
<td>General Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM</td>
<td>1154*</td>
<td>General Chemistry Lab I</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CHEM</td>
<td>1155*</td>
<td>General Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM</td>
<td>1156*</td>
<td>General Chemistry Lab II</td>
<td>1</td>
<td></td>
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<tr>
<td>CHEM</td>
<td>2541</td>
<td>Organic Chemistry I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHEM</td>
<td>2543</td>
<td>Organic Chemistry Lab I</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>1121#</td>
<td>Visual Basic</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH</td>
<td>1296^</td>
<td>Calculus I</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MATH</td>
<td>1297^</td>
<td>Calculus II</td>
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<tr>
<td>MATH</td>
<td>3280</td>
<td>Differential Equations</td>
<td>4</td>
<td></td>
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<tr>
<td>PHYS</td>
<td>2013</td>
<td>General Physics I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS</td>
<td>2014</td>
<td>General Physics Lab I</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PHYS</td>
<td>2015</td>
<td>General Physics II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS</td>
<td>2016</td>
<td>General Physics Lab II</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WRIT</td>
<td>1120</td>
<td>College Writing</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

* Transfer students at the sophomore level (or above) must substitute an additional engineering elective for CHE 1011 (at the 2xxx level, or higher; subject to department approval).

** Successful completion of CHE 2111 (with a grade of C+ or better) is also required for admission to the professional program.

+ CHEM 1161, 1162 Honors General Chemistry I and/or II may replace 1153, 1154 and/or 1154, 1156.

# Or CS 1411 Programming in Matlab. Other programming courses may be substituted subject to department approval.

^ MATH 1596, 1597 Honors Calculus I and/or II may replace 1296 and/or 1297.

Apply online for admission to the upper division professional program.

- [www.d.umn.edu/che/studentAdvising/upperDivisionApp.html](http://www.d.umn.edu/che/studentAdvising/upperDivisionApp.html)
- Application forms are also available in the ChE office, 176 Engr (see attachment in the appendix).

Upper division applications are due in either semester:

- November 1 for Spring Semester Registration (Decision by November 5)
- March 15 for Summer or Fall Semester Registration (Decision by March 20)

Admission to the BSChE upper division program is competitive and based upon the assessment of a student’s potential for successful in the junior and senior level courses. Admission to the upper division is reserved for students with a subset GPA of 3.00, or higher, in the required courses listed above. Applicants with GPA lower than 3.00 are admitted on a space-available basis, with priority determined by the cumulative GPA in all engineering, physics, mathematics, and chemistry courses completed when the application is reviewed (including, but not limited, to the courses listed above).
We advise unsuccessful applicants to find a different major better suited to their aptitude and interests. Help with selecting an alternative major is available in the college student affairs office (140 Engineering) or Career Services (22 Solon Campus Center).

### 3.4 Transfer Students

Transfer students with an associate’s degree, or who have completed most of the lower division courses, may be granted temporary permission to register for a limited set of upper division courses. Work with your advisor to plan your schedule for the remaining program requirements at UMD. In addition, be aware that:

- Advanced transfer students with 36 or more credits and one year each of calculus and general chemistry are required to take a 2XXX or higher level engineering elective in place of ChE 1011 Introduction to Chemical Engineering. Electives are subject to department approval and may require an Academic Petition (available in the SCSE Student Affairs, 140 Engr).
- Transfer students may apply for admission to the professional program only after completing ChE 2111 with a grade of C+ (or higher). All other requirements apply.

### 3.5 Liberal Education Requirements

Liberal education is an important part of the mission of the University of Minnesota. A strong liberal education prepares engineering students to work in a diverse workplace and economy. Talk to other students for liberal education course recommendations. As you plan for completing the liberal education requirements, be aware of the following:

- A minimum of 39 credits of liberal education are required.
- Many of our required major courses automatically satisfy requirements as shown in the following table.
- **You may complete Liberal Education courses in any sequence.**
- To avoid unnecessary credits, find courses in the Knowledge Domains of Social Science (SS), Humanities (H), and Fine Arts (FA) that also satisfy Key Topics of Global Perspectives and Cultural Diversity in the US (See second table below for options).
- Students may elect to take a certain number of liberal education courses with the S-N grading system (Satisfactory-No Credit) if they are not required by the major. For example, Chemistry, Calculus, and Physics are liberal education courses, but are also required for the ChE degree and must receive a letter grade (A-F). For more information about S-N grading, see [www.d.umn.edu/vcaa/GradingandTranscripts.html](http://www.d.umn.edu/vcaa/GradingandTranscripts.html)

<table>
<thead>
<tr>
<th>Lib Ed Requirement</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing and Information Literacy</td>
<td>Writ 1120 College Writing (3 cr)</td>
</tr>
<tr>
<td>(3 cr)</td>
<td>• (Students with an ACT score of 32 or higher are exempt from Writ 1120)</td>
</tr>
<tr>
<td>Oral Communication and Languages</td>
<td>ChE 3211 Chemical Engineering Lab I (3 cr)</td>
</tr>
<tr>
<td>(3 cr)</td>
<td></td>
</tr>
<tr>
<td>Logic and Quantitative Reasoning</td>
<td>Math 1296 Calculus I (5 cr)</td>
</tr>
<tr>
<td>(3 cr)</td>
<td></td>
</tr>
<tr>
<td>Natural Sciences (6 cr, 2</td>
<td>Chem 1153/1154 General Chemistry I + Lab (4+1 cr)</td>
</tr>
<tr>
<td>designators)</td>
<td>Phys 2013/2014 General Physics I and Lab (4+1 cr)</td>
</tr>
<tr>
<td>Social Sciences (6 cr, 2</td>
<td>Consider Electives with Superscript 1 or 2</td>
</tr>
<tr>
<td>designators)</td>
<td></td>
</tr>
<tr>
<td>Humanities (6 cr, 2 designators)</td>
<td>Consider Elective with Superscript 1 or 2</td>
</tr>
<tr>
<td>Fine Arts (3 cr)</td>
<td>Consider Elective with Superscript 1 or 2</td>
</tr>
<tr>
<td>Global Perspectives (3 cr)</td>
<td>See SS, H, or FA for dual counting course for this requirement</td>
</tr>
<tr>
<td>Cultural Diversity in the US (3</td>
<td>See SS, H, or FA for dual counting course for this requirement</td>
</tr>
<tr>
<td>cr)</td>
<td></td>
</tr>
</tbody>
</table>
Select at least one course from each of the following categories (columns) to fulfill Social Studies (SS), Humanities (H), or Fine Arts (FA).

<table>
<thead>
<tr>
<th>Global Perspectives</th>
<th>Cultural Diversity in the US</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 1080</td>
<td>AMIN 1020 American Indian Experience (H)</td>
</tr>
<tr>
<td>ANTH 1604</td>
<td>AMIN 1606 Intro to American Indian Literature (H)</td>
</tr>
<tr>
<td>ARTH 1305 Survey of Nonwestern Art (H)</td>
<td>ART 1814 Creating Across Cultures (FA)</td>
</tr>
<tr>
<td>ENGL 1582 Intro to World Literature (H)</td>
<td>MU 1005 Jazz Studies (FA)</td>
</tr>
<tr>
<td>ENGL 1583 Topics in Contemporary African Literature (H)</td>
<td>PHIL 1003 Ethics and Society (H)</td>
</tr>
<tr>
<td>ENGL 1585 Australian and New Zealand Literature (H)</td>
<td>SOC 1101 Intro to Sociology (SS)</td>
</tr>
<tr>
<td>SW 1210 or 1212 Global Issues (SS)</td>
<td>SOC 1201 Sociology of the Family (SS)</td>
</tr>
<tr>
<td></td>
<td>SW 1619 Race, Class, Gender in the US (SS)</td>
</tr>
<tr>
<td></td>
<td>WS 1000 Intro to Women Studies (SS)</td>
</tr>
</tbody>
</table>

### 3.6 Minors

The BSChE degree does not require a minor. However, interested ChE students may earn one of the following minors without significant additional credit requirements by carefully selecting advanced chemistry and science/engineering electives:

**Biochemical Engineering Minor**
- BIOL 1011 - General Biology I (5.0 cr)
- Advanced Chemistry Electives: CHEM 3322 - Biochemistry (3.0 cr), CHEM 3324 - Biochemistry Laboratory (1.0 cr), CHEM 2542 - Organic Chemistry II (3.0 cr), CHEM 2544 - Organic Chemistry II Laboratory (1.0 cr)
- Science/Engineering Electives: CHE 4601 - Biochemical Engineering I (3.0 cr), CHE 4701 Biochemical Engineering II (3.0 cr)

**Chemistry Minor**
- Advanced Chemistry Electives: Chem 2542, 2544, and (3322 or 4351 or 4641)
- Science/Engineering 2XXX Elective: Chem 2212 or 2242 or (2222 and 2223)

**Energy Engineering Minor**
- ECE 2006 - Electrical Circuit Analysis (4.0 cr). Satisfies 2XXX Science/Engineering elective
- Science/Engineering 3XXX or higher Electives: Two courses from CE 5515, CHE 4603, 4612, ECE 4501, 5501, ME 4050, 5325

**Environmental Engineering Minor**
- Chem 2212 Environmental Chemistry or (2222 and 2223 Quantitative Analysis & Lab)
- Two courses from CE 3225, CHE 4601, 4615, ESCI 3101, 3102

**Mathematics Minor**
- Science/Engineering 3xx Electives: Two courses from Math/Stat 3XXX (e.g., Math 3298, Stat 3411)
- Science/Engineering 4XXX Elective: One course from Math/Stat 4XXX (e.g., Math 4326)

**Material Science and Engineering Minor (New in 2016)**
- Three Science/Engineering electives from the approved list for the minor

### 3.7 Department Honors

The ChE Department awards honors to graduates that meet each of the following criteria:
- GPA 3.50 (or higher)
Recommendation of ChE Faculty based on any combination of extraordinary participation in research, leadership, engineering societies, and service to the department and profession. Students may elect to participate in the university honors program (www.duluth.umn.edu/honors).

3.8 Integrated Master’s Degree Program
Advanced students may apply to participate in the integrated Chemical Engineering Master Degree program during their fourth year. Students admitted to the MSChE program may use up to nine credits at the 5XXX level, or higher, from their undergraduate program towards the requirements for the MSChE degree. For more information, please see the Director of Graduate Studies, Dr. Rother.
4 Advisement & Registration

While students are responsible for their academic planning, there are helpful resources available to assist students. Academic advising at UMD involves more than simply planning a schedule for each term. It offers the opportunity for students to develop short and long range life goals, to understand themselves, to explore the world of work, to understand their decision making process, and to engage in academic planning. In these processes, faculty advisers serve as experts in their fields, and provide of general and specific program information. The integration of student growth through these experiences and the formal academic curriculum develops mature, self-directed students who are capable of thinking and acting rationally within their own communities and society.

Student advisement is an integral part of the chemical engineering student experience. The Department of Chemical Engineering is committed to providing quality advice to our students. Each semester, the department schedules group advisement meetings to disseminate general information to all students before registering for classes the following semester. Students have a hold on their registration that is removed after attending a group advisement session.

4.1 Faculty Advisers

Each ChE student also has an individual adviser on the chemical engineering faculty who is available to meet with him or her any time during the semester. Schedule an appointment with your advisor if you have unusual circumstances that need individual attention. Faculty advisers post their office hours and meeting sign-up sheets each semester before registration. If you are not sure who your advisor is, check with the Department of Chemical Engineering (176 Engr) or Swenson College of Science and Engineering office of Student Affairs in 140 Engineering Building.

Students are encouraged to meet regularly with their adviser to ensure that they are on track as they progress through the program. Advisers expect students to come prepared to discuss their plans by bringing their registration or graduation plan and APAS document to the meetings (see sections 4.3 and 4.7). Faculty advisers serve as valuable resources for up-to-date information on:

- Course availability and class scheduling
- Announcements of Coop/internship opportunities
- Opportunities for research mentors
- Career guidance or information about graduate school

4.2 SCSE Student Affairs

Swenson College of Science and Engineering advisors are available to assist with general advising issues that include registering for classes, registration waiting lists, transfer credits, petitions for changes to the degree program, APAS changes, etc. Contact the SCSE SA office for additional information:

- Office: 140 Engr
- Phone: (218) 726-6360
- Email: scsesa@d.umn.edu
- Web Site: [www.d.umn.edu/scse/students/advising/index.html](http://www.d.umn.edu/scse/students/advising/index.html)

4.3 Permission Numbers for Upper Division Courses

Some Lower Division ChE 1XXX-2XXX and Upper Division ChE 3XXX (or higher) courses require permission numbers for registration. You must be admitted to our upper division professional program before registering for ChE 3XXX level courses, except ChE 3031 Computational Methods. We control enrollment for upper division students in labs, independent study, research, Coops, and graduate level courses. The following table lists courses requiring permission numbers and requirements in addition to meeting the course prerequisites. Requests permission from faculty
members. Permission numbers have expiration dates. Use your permission numbers as soon as possible.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Requirements beyond prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE 2111</td>
<td>Material and Energy Balances</td>
<td>Offered Fall and Spring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fall reserved for ChE majors</td>
</tr>
<tr>
<td>ChE 3211</td>
<td>Lab I</td>
<td>Limited enrollment per section</td>
</tr>
<tr>
<td>CHE 3241</td>
<td>Principles of Particle Technology</td>
<td>Limited enrollment per section</td>
</tr>
<tr>
<td>ChE 3791</td>
<td>Independent Study</td>
<td>Faculty sponsor (signed permission form)</td>
</tr>
<tr>
<td>ChE 3894</td>
<td>Independent Research</td>
<td>Faculty sponsor (signed permission form)</td>
</tr>
<tr>
<td>ChE 3196</td>
<td>Coop I (1 cr)</td>
<td>Department head approval (signed contract)</td>
</tr>
<tr>
<td>ChE 3296</td>
<td>Coop II (2 cr)</td>
<td>Department head approval (signed contract)</td>
</tr>
<tr>
<td>ChE 4211</td>
<td>Lab II</td>
<td>Limited enrollment per section</td>
</tr>
<tr>
<td>ChE 4402</td>
<td>Process Control</td>
<td>Limited enrollment per section</td>
</tr>
<tr>
<td>ChE 4613</td>
<td>Air Pollution Control</td>
<td>Space reserved for Environmental Science Students</td>
</tr>
</tbody>
</table>

### 4.4 Email Communication

Email is the university’s primary mechanism for communicating important information to students. Please read and respond to your email from the department, faculty, and advisers. When communicating with your professors via e-mail, it is important to remember that many faculty members view an e-mail message as a letter that was delivered quickly rather than a quick conversation. Here are a few tips to keep adapted from Tomorrow’s Professor (http://cgi.stanford.edu/~dept-ctl/tomprof/posting.php?ID=1066):

1. **USE APPROPRIATE SALUTATIONS AND TITLES:** Just like letters, e-mails should begin with a proper salutation. If “Dear Dr. Davis” seems too formal, begin your message with “Hello Dr. Davis,” but avoid the kinds of casual greetings you would use with friends (e.g., “Hey”) or no greeting at all. The faculty member will let you know when it is okay to use his or her first name.

2. **IDENTIFY YOURSELF:** Faculty interact with a large number of students every semester. At the beginning of your message, refer to the class you are taking with the faculty member or how the faculty member knows you, especially when you are contacting someone who does not know you very well. Conclude your message with your full name.

3. **AVOID TEXT ACRONYMS:** If you are responding to e-mails on a smart phone, it is tempting to abbreviate or shorten words and phrases (e.g., u instead of you). However, abbreviations are easy to misinterpret or may be completely misunderstood.

4. **Use proper grammar and spelling.** Writing well requires practice – careful writing in email is one way to practice good writing.

5. **BEWARE OF YOUR TONE:** Perhaps the most difficult part of writing an e-mail is achieving the right tone. If you are writing an especially sensitive e-mail, let your final draft sit overnight and reread it before sending to make sure the message is appropriate. You also can ask a colleague or friend to read your message and offer feedback about how the message might be perceived. Remember, e-mail creates a permanent record of your communication that you have no control over after you click the send button. So if you are worried about the tone of your e-mail, you might want to skip the message altogether and ask for a meeting with the faculty member.
6. KEEP IT SIMPLE: Long e-mails with too many questions can get confusing. If your message is more than one or two paragraphs, rethink the purpose of the message. Start with the most important question or topic. A lengthy e-mail may be a signal that the subject warrants a phone call or in-person meeting rather than a written communication. E-mail communication is an important part of building positive relationships with your professors. It is always worthwhile to take the time to make sure your messages are clear and appropriate.

4.5 FaceBook & LinkedIn
Friend us! The department uses FaceBook to communicate opportunities to our current students and keep in touch with alumni. We also invite seniors to join our LinkedIn group to help them network and transition into their professional careers.

4.6 Graduation Planner
Try the web based Graduation Planner (www.d.umn.edu/students) to map out your classes for each semester. Bring a copy to your advisor for review during your advisement meetings. Unfortunately, Grad Planner is not always current. Get the latest department news during advisement meetings held prior to registration periods each semester.

4.7 Adding, Auditing, or Dropping a Class
Undergraduate students may withdraw from classes without collegiate approval through the tenth week of class with a notation of a "W" on their record. Deadlines for cancelling or adding classes are available on the One Stop website. http://d.umn.edu/onestop/

For information about auditing a course, go to www.d.umn.edu/onestop/registration/guidelines/

4.8 Reenrollment
Occasionally, a student needs to pause their enrollment due to extenuating circumstances. This may be due to coop, internships, illness, financial, family or personal reasons. To become reactivated and register for classes, a student must complete a simple “Re-Enrollment Request” form (http://d.umn.edu/onestop/forms/pdf/reenrollment.pdf)

4.9 APAS
The university uses the Academic Progress Audit System (APAS) to check that you have met all degree requirements. Access your APAS from the UMD web site (www.d.umn.edu/students). Faculty advisors use your APAS to monitor your progress towards completing the BSChE degree.

4.10 Study in Engr 270
The ChE department provides study space in Engr 270 for our majors. Informal study groups form each semester in Engr 270. This peer-based service is open to all ChE majors. You may request an electronic access key from the Department Office, 176 Engr. The space is dedicated for the following activities:
- Study group meetings
- Group projects
- Design teams
- Engineering society meetings
- Student and professional presentations
- Campus recruitment visits
- Seminars
- Lab presentations
• Limited computer and printing capabilities
• Group advisement meetings

4.11 Keys to Success

The B.S. Ch.E. is a professional degree program that prepares you for success in the engineering profession by emphasizing competency skills along with theory and analysis. Unlike most professional 2nd degree programs (such as law and medicine) that require a 1st degree, engineers earn their professional degree at the bachelor (undergraduate) level. What does this mean for you? We expect our students to begin developing professional competencies before graduation. Several keys to successfully completing the chemical engineering degree program include:

• Attend all classes and lab sessions (instructors tend to test you on what they covered in class).
• Engage in class discussions and active learning exercises - ask questions, take notes.
• Plan on studying at least three hours for each hour that you spend in class – more than three hours will be required for your engineering courses.
• Read all required material.
• Seek help from instructors, tutors, and peers.
• Join a study group (be careful to do your own work).
• Contribute to team projects.
• Do not wait until the last moment to begin working on homework or projects.
• Complete and turn in homework, reports, and projects on time.
• Make your best effort – be neat, organized, and clean, use proper formats, etc.

Though rigorous, there will be time for engaging in extracurricular activities. The reward of a job well done is entry into a challenging and exciting career where you become part of the solution (not the precipitate ☺).

4.11.1 Do Your Own Thinking and Learning

Modern courseware includes beautifully illustrated textbooks, flashy video, PowerPoint slides, software packages, equation summaries, web sites, worked problems, etc. If we are not careful, all of these crutches can overwhelm us, and relieve us from the responsibility we have for our own education, and the ability to think – which hurts us as learners. These accoutrements may help us pass general chemistry, but they do not promote mastery of the material. Fred Watson (Chemical & Engineering News, 2011) recommends the following study regimen:

• Perform a cursory reading of the next topics from textbook and other course materials before the next class or lecture.
• Answer questions and work end-of-chapter problems. Reread in depth appropriate sections of the text to gain insight into how to approach each question or problem.
• Before each quiz or exam, read the assigned chapters and merge your course notes into outline of the chapters. The text usually contains an outline of the chapter; if not, then you should get into the habit of making your own.
• Make a list of pertinent equations with conditions where and when they apply.
• The night before the exam, read over your outline and equation summary a few times.

4.11.2 UMD Academic Integrity Policy

Scholastic dishonesty tarnishes UMD’s reputation and discredits the accomplishments of students. UMD is committed to providing students every possible opportunity to grow in mind and spirit. This pledge can only be redeemed in an environment of trust, honesty, and fairness. As a result, academic dishonesty is regarded as a serious offense by all members of the academic community.
All faculty, staff, and students are expected to participate in maintaining the highest levels of academic integrity. Additional information is available at: www.d.umn.edu/conduct/integrity

The chemical engineering faculty expects its students to take full responsibility for their learning. You must maintain a high degree of personal and academic integrity. There are two types of activities in a class: learning and assessment. Students usually study together on homework, labs, and projects – but each of you is expected to produce your own original data, homework and exam solutions, reports, presentations, etc. As a professional degree program, we have zero tolerance for cheating, plagiarism, or other forms of dishonesty (read our professional society AIChE Code of Ethics in the appendix). Scholastic dishonesty in any portion of academic work for a course may be grounds for awarding a grade of F for the entire course, at the discretion of the instructor. Incidents of academic dishonesty are reported to the UMD Office of Student and Community Standards.

One of the hidden costs of cheating is that it can deceive cheaters into thinking that their higher scores are actually a sign of intelligence and skill. A growing body of research suggests that while cheaters are trying to beat the system, they are also engaging in destructive self-deception, inflating their own estimates of how they will do in the future. A full text of the study is available at: www.pnas.org/content/early/2011/03/02/1010658108.full.pdf+html

4.11.3 Writers' Workshop

UMD offers free writing support to all members of the campus community at the Writers’ Workshop. The consultants will work with you on any writing project at any stage in the writing process. Students must have permission from their instructors to see a Writer’s Workshop consultant for all take-home exams.

To make an appointment, visit d.umn.edu/writwork or stop by the Learning Commons on the second floor of the Kathryn A. Martin Library. Look for the Workshop’s trademark wall mural covered with quotations about writing.

4.11.4 Tutoring Center

The tutoring center is located in the Learning Commons on the second floor of the library. Online help is also available. Tutors are available to help with the following subject areas related to Chemical Engineering: Chemistry, Computer Science, Economics, Mathematics, Physics, Statistics, and Writing. See the center’s web site for more information and schedules: http://www.d.umn.edu/tutoring.
5 Balance Your Academic Experiences with Extracurricular Activities

We encourage you to become well-rounded by balancing your academic and personal lives. Consider engaging in appropriate extracurricular activities where you will begin to develop a network of friends and professional contacts, as well as interpersonal, team, and leadership skills. Start planning early for the extracurricular experiences you want to accomplish before graduation!

Employer’s Checklist

- A good grasp of these engineering fundamentals
  - Mathematics and statistics
  - Physical and life sciences
  - Information technology
- A good understanding of the design and manufacturing process (i.e., an understanding of engineering)
- A basic understanding of the context in which engineering is practiced, including:
  - Economics and business practice
  - History
  - The environment
  - Customer and societal needs
- A multidisciplinary systems perspective
- An awareness of the boundaries of one’s knowledge, along with an appreciation for other areas of knowledge and their interrelatedness with one’s own expertise
- Good communication skills
  - Written
  - Verbal
  - Graphic
  - Listening
- An ability to impart knowledge to others
- High ethical standards
- An ability to think critically and creatively as well as independently and cooperatively
- Flexibility – an ability and the self-confidence to adapt to rapid/major change
- Curiosity and a lifelong desire to learn
- A profound understanding of the importance and strong commitment to teamwork, including extensive experience with and understanding of team dynamics
- An awareness and strong appreciation for other cultures and their diversity, their distinctiveness, and their inherent value

Source: Boeing Company

The Top-10 Candidate Skills/Qualities Employers Seek

1. Ability to verbally communicate with persons inside and outside the organization
2. Ability to work in a team structure
3. Ability to make decisions and solve problems
4. Ability to plan, organize, and prioritize work
5. Ability to obtain and process information
6. Ability to analyze quantitative data
7. Technical knowledge related to the job
8. Proficiency with computer software programs
9. Ability to create and/or edit written reports
10. Ability to sell or influence others

Source: Job Outlook 2013, National Association of Colleges and Employers
5.1 Industrial Internship/Coop ChE 3196 & 3296

Students can work for a company as a chemical engineering intern Coop student (for credit) or as a chemical engineering intern. Students who intern – without enrolling for any credit – do not need to meet any departmental requirements or standards. While the department does not have a formal placement program, many companies recruit students on campus for Coop/intern positions. See Career Services for assistance.

The chemical engineering department strongly encourages students to participate in an industrial internship or Coop experience before graduation. An internship provides experience in multidisciplinary engineering environments and gives students some ideas of various engineering career paths they may consider after graduation.

Internships typically last through a summer, but may involve part-time work during the school year. Coops are full time employment (at least 35 hours per week) and generally last from one semester to 15 months. However, long-term internships (more than a summer) may cause problems with student status and related issues if the student is not enrolling in a course for credit.

Students desiring credit for Coop experience must enroll in ChE 3196 (1 credit) for a semester or summer term during their Coop. This course is open to juniors or seniors who have been admitted to the upper division professional chemical engineering program, and who are in good standing in the department. Transfer students must complete ChE 2111 before enrolling in ChE 3196. Students on long term Coops or who wish to participate in more than one Coop may take ChE 3196 up to three times, or enroll in ChE 3296 (2 credits) after 3196. Details of registration and requirements for credit are available at: www.d.umn.edu/che/studentAdvising/Coop.html. Coop credits may be used for one of the following options:

- Counts for 2xxx-3xxx level Science or Engineering elective requirement (up to 3 credits)
- Transfer students may use 3-credits of Coop in place of the 3-credit requirement of ChE 1011 Intro to ChE.

Students who do not need these credits for degree requirements may still wish to enroll in the Coop course for the following reasons:

- They are granted full time equivalent status during the Fall or Spring Semester, which defers loan payment and may help with various insurance requirements.
- International students (visa) must work with the International Student Counselor regarding remaining full-time student status.
- Coop credits document your engineering work experience on your transcript for potential employers and look better on the resume.

Coop students that do not register for ChE 3196 or 3296 need to take the following steps before taking time off for the Coop:

- If you have financial aid, make an appointment for an exit interview with Financial Collections Department in Darland 129 (218-726-8103). Exit interviews are required for students with loans.
- Meet with your advisor to discuss your academic plans after your Coop.
- Consider using up to 3 coop credits for 3XXX or higher Science or Engineering Elective. Obtain a registration permission number from the department office staff for ChE 3196 or 3296 after meeting with the coop instructor and for signatures on the Coop contract.
- Resolve any scholarship requirements/issues.
- Resolve any housing issues (local on-campus, contracts, leases, etc.).
5.2 Research Opportunities

Students interested in research careers or pursuing advanced degrees in graduate school may consider opportunities for obtaining research experience before graduation. There are several different opportunities for becoming involved in research on campus.

5.2.1 UROP (Undergraduate Research Opportunities Program)

UROP students apply for a research stipend through the University of Minnesota. Students work with a faculty sponsor to generate a short research plan and proposal.

- Faculty sponsors may come from any department on campus.
- Awards are competitive and given semiannually. UROP proposals are generally due in early in the months of October and March each year.
- Once the work is completed, stipends will be put in the student’s account through the scholarship system and will be considered part of their financial aid package.
- Details of the proposal and award process are available from the UROP web site (www.d.umn.edu/urop/description.html).

5.2.2 Independent Study/Research

ChE students may arrange to participate in independent study or research for credit under the direction of a member of the ChE faculty, or other SCSE faculty members. You may use up to three Independent study/research credits to satisfy Science or Engineering elective requirements.

- ChE 3791 Independent Study (1-3 cr, max 3 cr); Prereq BSChE cand. Directed individual study arranged with instructor and head of department before registration.
- ChE 3894 Chemical Engineering Research (1-3cr, max 6 cr); Prereq-BSChE cand. Experience in a selected research area. Student must present a satisfactory written report and oral presentation.
- You must have an agreement with a faculty member before registering for ChE 3791 or 3894.

5.2.3 Research Experience for Undergraduates (REU)

Each summer, universities around the country offer paid internships in their research facilities as part of the REU program. These programs are typically funded by the National Science Foundation and last 10 weeks in June through August. Stipends range from $4000 to $6000, and may include travel allowances. The department sends email notices of these opportunities every spring. Applications are usually due in January, February, or March.

5.3 Student Organizations for Chemical Engineers

SCSE and ChE have several student organizations and societies for engineers where you can network with friends, become involved in service learning, and develop leadership skills. Here is a sample:

AIChE (American Institute of Chemical Engineers, UMD Student Chapter)

- Open to all ChE majors
- Student chapter meetings are Wednesday, 5 PM in Engr 270
- Advisor: Professor Steve Sternberg

SWE (Society of Women Engineers), UMD Student Chapter

- Open to all engineering majors
- Advisor:
**SME** (Society for Mining, Metallurgy and Exploration, UMD Student Chapter)
- Open to all engineering, science, and business majors
- Advisor: Professor Richard Davis

**MNSPE** (Minnesota Society of Professional Engineers, UMD Student Chapter)
- Open to all engineering majors
- Advisor: Professor Steve Sternberg

**Omega Chi Epsilon** (Chemical Engineering Honor Society)
- Junior and senior chemical engineering majors
- By invitation
- Advisor: Professor Richard Davis

**Tau Beta Pi** (Engineering Honor Society)
- Junior and senior engineering majors
- By invitation
- Advisor: Professor Richard Davis (ChE)

### 5.4 Study Abroad

Many chemical engineering students experience study abroad before graduation. Depending on the program, you can go for a short January or May term, a summer, one semester, or a year. For example, UMD ChE students have studied abroad in Australia, China, England, Germany, Mexico, Poland, Spain, and Sweden.

- Visit **Study Abroad** in 138 KPlz for **International Programs and Services** (www.duluth.umn.edu/ips) information about established exchange programs at UMD.
- Study Abroad maintains a database of courses that transfer to UMD from abroad. If necessary, work with your advisor to identify other chemical engineering courses that transfer to UMD.
- If UMD (or the University of Minnesota) does not have what you want, several U.S. universities have international programs that are open to any student.
6 Graduation Plans
You can complete the online application for graduation if you are an active student and have completed 90 credits. Details are available from the UMD web site (www.duluth.umn.edu/onestop):

- Apply for the term in which you are completing all your degree requirements (i.e., last term of enrollment).
- Apply up to one year before you expect to complete all degree requirements. You must apply no later than the deadline for each term.
- Ensure that the major(s) and minor(s) you are completing are declared on the system.
- Complete the steps on the graduation checklist: http://www.d.umn.edu/onestop/degree-planning/graduation/undergrad-checklist.html

6.1 Fundamentals of Engineering (FE) Exam
Although many chemical engineers do not need a professional license to practice engineering for private companies, we strongly recommend that you take the first steps towards becoming a licensed engineer while you are still in school. Chemical engineers that work on environmental projects, as consultants, or in the public sector should consider professional engineering registration. At this stage of your career, you cannot predict the future.

We recommend that you become an Engineer-in-Training (EIT) by taking the Fundamentals of Engineering (FE) exam before graduation while your engineering education is fresh in your mind. It is much more challenging to take the exam years after graduation when your study and test taking skills are rusty. The Minnesota Society of Professional Engineers (www.mnspe.org) oversees professional Engineers-in-Training (EIT) examinations, which are available year-round at testing centers across Minnesota. Plan to spend several hours per week preparing for the FE exam. UMD Chemical Engineers have a very high pass rate on the FE/EIT exam (>90%).

6.2 Exit Interview
Graduating seniors are invited to participate in a small group exit interview with the department head during the final semester before graduation. Graduates complete surveys and share ideas with the department faculty on how to maintain the quality and improve our program and educational environment for future students.

6.3 Order of the Engineer: A Mini “Graduation Ceremony” Just for Engineers
The Order of the Engineer was initiated in the U.S. to foster a spirit of pride and responsibility in the engineering profession, to bridge the gap between training and experience, and to present to the public a visible symbol identifying the engineer (www.order-of-the-engineer.org). The ceremony is typically held on the Friday afternoon before Commencement in the Spring Semester (last day of final exams) and again at the end of the Fall Semester.

At the ceremony, graduating engineers are invited to accept the Obligation of the Engineer and to wear a stainless steel ring on the little finger of the working hand. The Obligation is a creed, similar to the oath generally taken by medical students, which sets forth an ethical code. Initiates, as they voluntarily accept the obligation, pledge to uphold the standards and dignity of the engineering profession and to serve humanity by making the best use of Earth's precious wealth.

The Order is not a membership organization. There are never any meetings to attend or annual dues to pay. Instead, the Order does foster a unity of purpose and honoring of one's pledge lifelong. UMD is the first university in the state of Minnesota to have initiation of its graduate engineers as an official link to the Order.
• The initiation is held at the end of each semester on the Friday afternoon of the last day of final exams (the day before commencement in the spring semester).
• The ceremony is dignified and recognizes each graduate individually.
• We invite all engineering graduates to join the Order of the Engineer.
• We encourage family and friends to view the ceremony and honor the engineering graduates. The department holds and open-house prior to the ceremony for students to show the chemical engineering facilities and labs to visiting family and guests.
• A reception follows the ceremony for engineering graduates to greet family, friends, and engineering faculty.
• A modest, one-time fee covers the cost of the diploma and stainless steel ring.

6.4 Keep In Touch!
We are proud of our graduates and the successes they achieve in their careers. Please keep us up-to-date on where you are and what you are doing. The ChE department uses several tools to keep in touch with our alumni as well as help you stay connected with each other:
• Department electronic newsletter published annually including news from alumni.
• Occasional surveys of how you are doing and to solicit feedback on what we can do better.
• Social networking web sites (FaceBook, LinkedIn, etc).
7 Frequently Asked Questions (FAQ)

Look here first for answers to common questions asked by ChE students, before seeking information from the department of faculty advisors.

7.1 What is a Chemical Engineer?

Chemical engineers are often referred to as the Universal Engineer because they find opportunities to contribute in practically every industry.

- Chemical engineers bridge science and manufacturing to solve problems involving the production or use of chemicals.
  - They design equipment and develop processes for large-scale chemical manufacturing, plan and test methods of manufacturing products and treating byproducts, and supervise production.
  - Chemical engineers work in a variety of manufacturing industries other than chemical manufacturing, such as those producing electronics, food, energy, materials, pharmaceuticals, minerals, and pulp and paper.
  - They also work in the healthcare, biotechnology, environmental, safety, and business services industries.
- The knowledge and duties of chemical engineers overlap many fields that integrate applied principles of chemistry, physics, mathematics, and engineering.
  - They frequently specialize in a particular chemical process or field
  - They must be aware of all aspects of chemicals manufacturing and how it affects the environment, the safety of workers, communities, and customers.
  - Chemical engineers use computer technology to optimize all phases of research and production, and need to understand how to apply computer skills to chemical process analysis, automated control systems, and statistical quality control.

7.2 What calculator will I need?

- Any scientific/engineering calculator will suffice.
- Most students find the calculators they used in high school adequate for college course work.
- Certain calculators are not permitted during the Fundamentals of Engineering exam for professional licensure (www.mnspe.org). Currently:
  - HP 33s and HP35s
  - Casio fx-115
  - TI 30x and TI 36x
- We generally rely on computers with MS Office (Excel PowerPoint, Word) or other engineering software to solve complex problems.

7.3 Do we require a personal computer?

- Beginning Fall 2015, all new UMD students are required to own a portable laptop computer (www.d.umn.edu/scse/students/tech/index.html).
- Desktop computers are available to students in full access computing laboratories at several locations on campus, including Engr 204.
- At a minimum, you will need MS Office software (Word, Excel, and PowerPoint) and web browsers.
- Consult the UMD Computer store for help selecting a computer that works best within the campus network and infrastructure (umdstores.com/SiteText.aspx?id=4567)
• Software is available for students at a substantial academic discount from the campus computer store and ITSS (www.d.umn.edu/itss/software/).

7.4 Does the department offer scholarships?
• There are several scholarships available for ChE majors listed on our scholarship web page: (www.d.umn.edu/che/studentAdvising/scholarships.html)
• In addition, the Swenson College of Science and Engineering invites students to apply for engineering scholarships. Applications are due mid-April each year and are awarded to students enrolled as full time UMD students in the following year. Details are available from web page: (www.d.umn.edu/scse/students/scholarships/)
• We use the SCSE Engineering scholarship application to identify students for ChE scholarships.
• University wide financial aid and scholarship information is available from the registrar: (www.d.umn.edu/onestop/student-finances/financial-aid/types/scholarships/)

7.5 How can I find out what textbooks are required before the next semester?
• Instructors provide their course textbook requirements to the Campus Bookstore by April 15 for Fall semester and Oct 15 for Spring semester.
• Visit the Bookstore’s web site to get author, title, and ISBN information about required textbooks, as well as comparison pricing at popular on-line vendors. Start by selecting the term at the following web site: umdstores.com/SelectTermDept.aspx

7.6 Are there any student employment opportunities in the department?
• The faculty uses student graders for most of our courses. Consult individual faculty members if you are interested in working as a grader for their courses. You must have completed the course with a grade of C or higher.
• Some faculty members have funding for undergraduate research assistants.
• The UROP program provides a stipend for undergraduate researchers.

7.7 How do I find a job?
• Build up your resume by working as an engineering intern or Coop student before graduation. Consider using a functional over a chronological resume.
• Read your email from the department and faculty (even after you graduate). The department frequently sends out information about companies that recruit our graduates.
• Visit the campus Career Services office for help with writing resumes, interview skills, meeting with potential employers on campus, etc. (www.d.umn.edu/careers). Career Services offers several workshops throughout the year. You are strongly urged to participate in these opportunities to prepare for your job search.
• Participate in mock interviews to practice and get the bugs worked out.
• Sign up on the the web site themuse (www.themuse.com) for current tips and advice on job searching, resume writing, cover letters, interviewing skills, etc.
• Things to DO:
  o Dress up to meet employers at information sessions, job fairs and interviews. Career Services will provide you with guidance on how to dress. How you dress sends a message about how seriously you want to be considered for the job.
 Bring current resumes with you to hand to employers at information sessions and job fairs. Use good quality paper for your resumes.

 Use a spell checker and have a trusted friend proofread your resume for spelling and grammar mistakes to correct before you give it out to prospective employers.

 When asked for a cover letter, write a true heart-felt letter with good examples that show enthusiasm for the opportunity you are seeking.

 Put your current GPA on your resume with two decimal places, e.g. 3.25/4.00.

 Research the companies you are interviewing with to find out about their business and employment opportunities – never show up and ask them what they do.

 Anticipate questions you may be asked during situational based interviews – and prepare good answers with specific examples. For example, you may be asked to provide an example of how you solved a difficult problem. Use an appropriate example from your experience with details about the problem and how you resolved it. Your experience may come from every aspect of your past, including work, team projects, sports, clubs, organizations, etc.

 Career Services can provide you with sample interview questions, or look for examples on websites, like themuse. (www.themuse.com)

 Think about your short and long term career goals. You will be asked a question similar to, “What are you looking for and what do you want from the employer?” Come with a plan or ideas of what you are looking for – not just that you want a job.

 Show enthusiasm for the job and company.

 Things NOT to do:

 DO NOT put your personal photograph on your resume – federal law prohibits companies from using this information.

 Do not chew gum during a meeting or interview with recruiters.

 Do not overuse the word “like” or other jargon in your conversations with prospective employers. Do your best to sound intelligent.

 Do not use profane language.

 Do not skip your interview. This may offend interviewers who will not consider you in the future, and damages the reputation of UMD. If you really cannot make it, call to cancel or reschedule the meeting with a lot of advance notice.

 Do not dress like a slob.

 This one is very important. You must register on Gold Pass at Career Services to sign up for campus interviews and to receive announcements about job opportunities. (goldpass.umn.edu)

 Prepare for, and participate in E-Fest, the UMD campus career fair for engineers, as well as other job fairs held on campus and in the community.

 Attend all recruiting company information sessions on campus. Ask them questions about the position(s) to prepare for an interview by learning about the company.

 Attend the University of Minnesota Twin Cities Campus and Michigan Technological University career fairs for engineers (both open to UMD Engineering Students)

 Join a professional networking site, such as LinkedIn (be sure to link with Chemical Engineering).

 Network with family and friends (including recent graduates from UMD).

 Many companies that visit campus require you to apply online after your interview. Find out what their process is for further consideration.

 Ask faculty and current or former employers for permission to use them as good references. UMD faculty members require signed reference request consent forms from our students (blank copy provided in appendix): www.d.umn.edu/umdhr/Policies/references/student.htm
7.8 **Is the UMD Chemical Engineering program accredited?**

- The UMD Chemical Engineering program is accredited by the Engineering Accreditation Commission (EAC) of ABET. ([www.abet.org](http://www.abet.org))
- ABET accreditation is your assurance that we meet the quality standards established by the chemical engineering profession. ABET accreditation is proof that UMD’s Chemical Engineering program has met standards essential to produce graduates ready to enter the field. Graduates from our ABET-accredited program have a solid educational foundation and are capable of leading the way in innovation, emerging technologies, and in anticipating the welfare and safety needs of the public. Be confident in your education—ABET accreditation is the trusted standard for employers worldwide.
- Many graduate schools require a degree from an accredited program for admission.

7.9 **Should I go to graduate school?**

- Talk to your advisor about the pros and cons of attending graduate school. A BSChE degree opens many doors for great careers in chemical engineering. However, if you wish to pursue a specialized research career, you will probably need an advanced degree.
- Get involved with research as an undergraduate student. Just like industry’s preference for hiring engineers with industry Coop or internship experience, top graduate schools look to admit students with research experience. There are many ways to get research experience before graduation, e.g., work with a faculty member on campus, apply for a summer REU (Research Experience for Undergraduates) at various universities around the country, intern at a national laboratory, or work in industrial R&D.
- Search for and apply to graduate programs that have active researchers in your area of interest.
- Many graduate programs require the GRE (Graduate Record Exam). Plan to take this in the fall semester of your final year before applying to graduate schools. ([www.ets.org/gre](http://www.ets.org/gre))
- A few of our graduates pursue law and medical degrees. Prepare for entrance by passing the LSAT and MCAT entrance exams.
- Ask a faculty member or employers to give you good references. UMD faculty members require a signed reference request consent form from our students (blank copy provide in appendix): ([www.d.umn.edu/umdhrt/studentjobs/Forms/referenceform.html](http://www.d.umn.edu/umdhrt/studentjobs/Forms/referenceform.html))

7.10 **Help!**

This student handbook is not meant to be encyclopedic, but rather a summary highlighting important topics for success. If you have additional questions that were not covered here, or on the ChE or UMD web sites, please contact your adviser or the department for help. We just might add your question to our list of FAQ for the benefit of future students!
8 Appendices

8.1 What do Chemical Engineers Do?
8.2 AIChe Code of Ethics
8.3 Sample Application for Admission to Professional Upper Division Program
8.4 Sample Student Reference Request Form
8.5 Example Engineering Scholarship Application
8.6 Letter to Parents
8.7 Plan for My College Experience
8.8 Gold Pass
8.9 CHEMCAD Installation
What Do Chemical Engineers Do?

Last May, chemical engineering seniors at UMD took their last final examinations, attended graduation ceremonies, threw their mortarboards up in the air, enjoyed their farewell parties, said goodbye to one another, then headed off in an impressive variety of geographical and career directions.1

Are you thinking about following in the footsteps of those graduates — spending the next few years learning to be a Chemical Engineer and applying what you learn in a career? If so, it is a safe bet that, like most people in your position, you have only a limited idea of what chemical engineering is or what chemical engineers do. A logical way for us to begin answering these questions might therefore be with a definition of chemical engineering.

Unfortunately, no universally accepted definition of chemical engineering exists, and almost every type of skilled work you can think of is done somewhere by people educated as chemical engineers. We will therefore abandon the idea of formulating a simple definition and instead take a closer look at what those recent graduates did, immediately after either graduation (or following a well-earned vacation). Consider these examples and see if any of them sound like the sort of career you can see yourself pursuing and enjoying.

- About 45% of the class went to work for large chemical, petrochemical, pulp and paper, plastics and other materials, or agrichemical processing firms.
- Another 35% went to work for government agencies or design and consulting firms (many specializing in environmental regulation and pollution control) and for companies in emerging fields such as microelectronics, alternative energy, and biotechnology.
- About 10% of the class went directly into graduate school in chemical engineering. The master’s degree candidates will get advanced education in traditional chemical engineering areas (thermodynamics, chemical reactor analysis and design, fluid dynamics, mass and heat transfer, and chemical process design), and get jobs doing process or control systems design or product development. The doctoral degree candidates will work on major research projects in bio or nanotechnology, and either go into industrial research and development or join a university faculty.
- The remaining 10% of the class went into graduate school in an area other than chemical engineering, such as medicine, law, and business — building on their chemical engineering problem solving skills.
- Several graduates went to work for companies manufacturing specialty chemicals — pharmaceuticals, paints and dyes, and cosmetics, among many other products. All of these companies hire chemical engineers to design and run their production processes.

To remain competitive they have to pay attention to such things as mixing efficiency, heat transfer, automatic temperature and liquid level control, statistical quality control, and control of pollutant emissions.
- Some went to work for companies that manufacture integrated semiconductor circuits. A critical step in the production of computer chips involves coating small silicon wafers with extremely thin and uniform films of semi-conducting materials. The graduates working in this area may be called on to identify reactions that can be used to produce the desired films, determine the best conditions at which to run the reactions, design the reactors, and continue to improve their operation.
- Some took elective courses in biochemistry and microbiology and got jobs with biotechnology firms. One graduate works on the design of pharmaceutical production processes that involve immobilized enzymes, biological chemicals that can make specific reactions go orders of magnitude faster than they would in the absence of the enzymes. Several others work on processes that involve genetic engineering, in which recombinant DNA is synthesized and used to produce valuable proteins and other medicinal and agricultural chemicals that would be hard to obtain by any other means.

• Some joined companies that manufacture polymers (plastics). One is working on the development of membranes for desalination of seawater (fresh water passes through, salt is kept out) and for gas separations (hydrogen passes through and hydrocarbons are kept out, or vice versa); another is developing membranes to be used in hollow-tube artificial kidneys (blood flows from the patient's body through thin-walled tubes; metabolic wastes in the blood pass through the tube walls but proteins and other important body chemicals remain in the blood, and the purified blood is returned to the body).

• A few of the UMD chemical engineering graduates went to medical school. (Chemical engineering graduates who take electives in the biological sciences have a strong record of success in gaining medical school admission.) One went to law school. Others enrolled in MBA programs and will probably move into management tracks in chemical-related industries.

• One graduate joined the Peace Corps for a two-year stint helping communities develop sanitary waste disposal systems and teaching science and English in a rural school. When she returns, she will earn a Ph.D., after ten years run for the United States Senate; win two terms, become head of a highly successful, private foundation dedicated to improving education in economically deprived communities. She will attribute her career successes to the problem-solving skills she acquired in her undergraduate training in chemical engineering at UMD.

• At various points in their careers, some of the UMD chemical engineering graduates will work in chemical or biochemical or biomedical or material science laboratories doing research and development or quality engineering, at computer terminals designing processes and products and control systems, at field locations managing the construction and startup of manufacturing plants, on production floors supervising and troubleshooting and improving operations, on the road doing technical sales and service, in executive offices performing administrative functions, in government agencies responsible for environmental and occupational health and safety, in hospitals and clinics practicing medicine or biomedical engineering, in law offices specializing in chemical process-related patent work, and in classrooms teaching the next generation of chemical engineering students.

The different careers described here are clearly too diverse to fall into a single category. They involve disciplines including physics, chemistry, biology, environmental science, medicine, applied mathematics, statistics, computer science, economics, management and information science, research, design, construction, sales and service, production supervision, and business administration. The one, single feature they have in common is that UMD Chemical Engineering graduates can be found doing them!
AIChE Code of Ethics

Members of the American Institute of Chemical Engineers shall uphold and advance the integrity, honor, and dignity of the engineering profession by:

• Being honest and impartial and serving with fidelity their employers, their clients, and the public;
• Striving to increase the competence and prestige of the engineering profession;
• Using their knowledge and skill for the enhancement of human welfare.

To achieve these goals, members shall:

• Hold paramount the safety, health and welfare of the public and protect the environment in performance of their professional duties.
• Formally advise their employers or clients (and consider further disclosure, if warranted) if they perceive that a consequence of their duties will adversely affect the present or future health or safety of their colleagues or the public.
• Accept responsibility for their actions, seek and heed critical review of their work and offer objective criticism of the work of others.
• Issue statements or present information only in an objective and truthful manner.
• Act in professional matters for each employer or client as faithful agents or trustees, avoiding conflicts of interest and never breaching confidentiality.
• Treat fairly and respectfully all colleagues and co-workers, recognizing their unique contributions and capabilities.
• Perform professional services only in areas of their competence.
• Build their professional reputations on the merits of their services.
• Continue their professional development throughout their careers, and provide opportunities for the professional development of those under their supervision.
• Never tolerate harassment.
• Conduct themselves in a fair, honorable, and respectful manner.

Tenets of Operation for Conservation of Life

A set of tenets are a code of conduct aimed at achieving injury-free and accident-free performance... They summarize potentially high risk behaviors to avoid. The more tenets that are violated at the same time, the greater the consequences can be.

1. Never operate equipment or tanks outside of design or environmental limits.
2. Always move to a safe, controlled condition and seek assistance when a situation is not understood.
3. Always operate with safety devices enabled., e.g., Lock-out/tag out system
4. Always follow all safe work practices and procedures and act to stop unsafe conditions and actions.
5. Always produce a product that meets or exceeds the customer’s requirements
6. Never contaminate or compromise a dedicated system.
7. Always report environmental or safety compliance information accurately and on time.
8. Always address abnormal conditions and clarify/understand procedures before proceeding.
9. Always follow written procedures for high-risk or unusual situations.
10. Always involve people with expertise and first-hand knowledge in decisions, improvements and changes that affect procedures and equipment.
APPLICATION FOR ADMISSION TO THE
UPPER DIVISION PROFESSIONAL PROGRAM OF
CHEMICAL ENGINEERING

NAME ________________________________
Last First Middle Initial

Advisor ________________________________
Year Started at UMD, or Catalog Year you are working from __________________________
Student I.D. Number ________________________________
Mailing Address ________________________________

Permanent Home Address ________________________________

Please check off the courses you have completed. These are required to receive upper division status.

☐ ChE 1011 Intro to Chemical Engineering
   (or ChE 2001 Intro to Environmental Engineering)  ☐ COMP 1120 College Writing

☐ ChE 2111 Material & Energy Balances  ☐ CS 1121 Visual Basic Programming

☐ CHEM 1153 General Chemistry I
   (or Chem 1161 Honors Chem I)  ☐ MATH 1296 Calculus I
   (or Math 1596 Honors Calc I)

☐ CHEM 1154 General Chemistry Lab I  ☐ MATH 1297 Calculus II
   (or Math 1597 Honors Calc II)

☐ CHEM 1155 General Chemistry II
   (or Chem 1162 Honors Chem II)  ☐ MATH 3280 Differential Equations

☐ CHEM 1156 General Chemistry Lab II  ☐ PHYS 2013/2014 General Physics I & Lab

☐ CHEM 2541 Organic Chemistry I  ☐ PHYS 2015/2016 General Physics II & Lab

☐ CHEM 2543 Organic Chemistry lab I

GPA: ________

Sign this form below and return to Julie - Chemical Engineering Office - 176 Engineering Building.

SIGNATURE ____________________________________________ DATE ___________________
University of Minnesota Duluth
Student Reference Request Consent Form

Student name (please print): __________________________

I request __________________________ to serve as a reference for me. The purpose(s) of the reference are:
(check all applicable spaces)

_______ application for employment
_______ all forms of scholarship or honorary award
_______ admission to another education institution

The reference may be given in the following form(s): (check one or both spaces)

_______ written
_______ oral

I authorize the above person to release information and provide an evaluation about any and all aspects of my academic and/or employment performance at the University of Minnesota Duluth to the following: (check all applicable spaces)

1. __ all prospective employers
   OR __ specific employers (list on reverse side)

2. __ all educational institutions to which seek admission
   OR __ specific educational institutions (list on reverse side)

3. __ all organizations considering me for an award or scholarship
   OR __ specific organizations (list on reverse side)

This authorization to provide references is valid for one (1) year from the date of my signature below, unless I specify an earlier ending date as follows:

Ending date: ______________________

Note: Under the Family Educational and Privacy Rights Act, 20 U.S. C. 1232(g), you may, but are not required to waive your right of access to confidential references given for any of the purposes listed on this form above. If you waive your right of access, the waiver remains valid indefinitely.

___________________________________
Student Signature

___________________________________
Date
Example Scholarship Application (Be sure to download the latest version from the SCSE web site)

University of Minnesota Duluth
Swenson College of Science and Engineering
Engineering Scholarship Application

Last Name: ___________________________ First Name: ___________________________ MI: __________

Student ID #: ___________________________ Gender: M F GPA: __________ Total Credits: __________

Major(s) (please circle): ChE CE ECE IE ME Citizenship (list country):

How many credits do you expect to take in: Fall 10 __________ Spring 11 __________

High School Graduated From: __________________________________________________________

City: ___________________________ State: __________ Zip: __________

If you had an internship with a company over the summer, please list the company.

__________________________________________________________________________________

Most engineering scholarships are merit-based and do not require financial need. However, a few donors have specified that the student have financial need, a military background, or membership to an engineering club. If you would like to be considered for any of these scholarships, please describe your financial need, military background (including any family member), or membership to any engineering club. Have you applied for financial aid, etc.?

__________________________________________________________________________________

__________________________________________________________________________________

By initialing this line, you authorize us to release the information on this application to the donors:

You will be notified in writing of the committee’s decision by August 2010. Please provide a complete summer address:

Street Address: ___________________________ City: ___________________________ State: __________ Zip: __________

Email and/or Telephone: ___________________________

Application Instructions

• In order to qualify for this scholarship you must have a cumulative GPA of 2.70 or better; have completed 30 semester credits (including credits registered for in spring semester); be enrolled in UMD Swenson College of Science and Engineering during both semesters of the upcoming academic year; and be an undergraduate student in one of the following fields at UMD: Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, Industrial Engineering, or Mechanical Engineering. If you will not be enrolled for both semesters (graduating early, internships or co-ops, etc.), you may be eligible for a partial year scholarship. Please explain this in your essay.

• Write a personal essay in which you summarize honors or awards you have received, extra-curricular activities in which you have participated (on or off campus, including employment), the position or rank you held, and any special contributions you made. Your essay should include your academic and personal achievements and your aspirations for the future.

• Essay must be word processed. Correct spelling and grammar are important.

• Application must be typed or printed legibly.

• Your personal statement may not exceed two pages – make sure your name is on all the pages.

• Evaluation of your application will be based on the clarity, completeness, and content of your essay.

• Applications are due no later than 4:00 pm, Friday, April 16, 2010. Please return the application to your department secretary.
TO: New Students and Families

FROM: Chemical Engineering Faculty and Staff

RE: Welcome to the Department of Chemical Engineering at the University of Minnesota Duluth.

We are pleased that you have joined our program and we will do our best to help you reach your goals. This letter provides an overview for students and their families of what we expect from our students to help them achieve success.

We offer a professional degree program that prepares graduates for fulfilling careers in chemical engineering and beyond. While chemical engineering is among the more challenging majors on our campus, it is also among the most rewarding! Each year, our graduates go on to exiting careers in a variety of fields and locations throughout the state, country, and abroad. The Department of Chemical Engineering provides a student learner-centered environment where students take responsibility for their own learning. The goal is to learn, not to trade performance for a grade.

Professional degree programs, like chemical engineering, require their graduates to demonstrate competence in their discipline. As part of this process, students declare their major as lower division students (freshmen and sophomore level) and complete foundation courses in math, science, and engineering. Students must demonstrate adequate preparation in these areas before formally applying to the professional program (junior and senior level). We only admit students to the professional program after they have completed the lower division courses at a satisfactory level of performance needed for success in the more rigorous upper division courses. Admission to the professional program is also space limited. Most students are well prepared and work hard to meet our admissions standards. Regrettably, a few students learn the hard way that we seriously enforce our standards of competence and quality of graduates. Some keys to success in our program include:

- Attend all your classes and lab sessions.
- Get help from instructors and faculty advisors.
- Do assigned readings and participate in class discussions and active learning exercises.
- Complete all assignments early. Do not wait until the last moment to begin.
- Set up a regular study schedule; three hours of study are expected for each hour spent in class.
- Do your best work and your own work.
- Use campus resources, such as the tutoring center and career services.
- Get involved in student organizations, research, and internships!
- Be a leader!

You will develop analytical and problem solving skills that set you apart – skills that are highly sought after in the workplace. Ultimately, however, you get the most out of the program according to what you put into it. Each year we conduct and exit interview with our graduating seniors. One of the questions we ask them is, “What would you tell a first-year chemical engineering student asking for advice about what to expect? Or what do you wish someone had told you during your fist year at UMD?” Here are some actual responses from last year’s graduates:
“The courses are challenging but there are always students and teachers there to help.”
“Keep your work organized and on hand, it will come back in the end.”
“Get involved and get to know your classmates.”
“Find a group of students to study with, the earlier the better.”
“Don’t be afraid to ask the upper division students questions.”
“It’s going to be a lot more work than you think, but take pride in it. You’re doing much more than a lot of other majors.”
“Be ready for hard work, but it’s what you truly like/want to do, it’s worth it in the end.”
“This will be the best time of your life. Study hard, play hard. This experience depends on what you put into it.”
“Start projects early. Don’t be afraid to ask for help from professors. Learn to work together with others on homework and studying to make life easier.”
“... Learn ‘how’ to study. Be patient and you will get very efficient at it.”

There is much more to becoming a chemical engineer than coursework. We encourage you to plan your college experience with a purpose to include extracurricular activities that add value to your education and life experiences. Get involved in student organizations in the department and on campus where you will begin networking with peers, develop teamwork and leadership skills, and give back through community service.

We strongly urge you to graduate with industrial experience through paid internships or a longer term Coop. Many students seek international experience by studying abroad for a semester. While these types of activities may extend your graduation date, you will gain valuable skills required by engineers practicing in a global economy.

Please share this letter with your support group of parents, family, and friends to help them see the bigger picture of what we have to offer and what we expect from you. While Minnesota State law prohibits us from discussing specific information about a student’s performance, such as grades, we are happy to talk to your family and friends about our program requirements and expectations. We have confidence in your ability to succeed, and will work hard to help you achieve your goals. We look forward to a bright and rewarding future ahead of you.

Sincerely,

Richard Adams
Professor and Head of Chemical Engineering
# Sample Plan for Chemical Engineering College Experience

## Year 1

### Fall:
- Learn about campus resources, including Career Services and register on Gold Pass
- Attend UMD E-fest Engineering Job Fair and company information sessions

### Spring:
- Start attending UMD AIChE Student Chapter meetings

### Summer:
- Update resume and Gold Pass

## Year 2

### Fall:
- Practice mock interviews with Career Services
- Attend UMD E-fest Engineering Job Fair

### Spring:
- Apply for admission to Professional Program in Chemical Engineering
- Participate in Study Abroad?
- Apply for Engineering Scholarship

### Summer:
- Update resume and Gold Pass.

## Year 3

### Fall:
- Attend UMD E-fest Engineering Job Fair
- Attend TC and Mich Tech Engineering Job Fairs
- Apply for Coop/Internships
- Apply to UROP program

### Spring:
- Run for office in AIChE or other student organization
- Participate in UROP or undergraduate research experience
- Apply for REU experience
- Apply for Engineering Scholarship

### Summer:
- Update resume & Gold Pass

## Year 4

### Fall:
- Attend UMD E-fest Engineering Job Fair
- Attend TC and Mich Tech Engineering Job Fairs
- Get a job
- Take GRE & Apply to Graduate School?

### Spring:
- Keep the job search going
- Take the FE exam
- Graduate!
GoldPASS - an online resource linking students and alumni to employment and internship experiences. All students and alumni are eligible to register with Career Services using GoldPASS.

**goldpass.umn.edu**

Registration gives students the opportunity to have their resumes included in a database searchable by employers at their request and to be eligible for on-campus interviews. GoldPASS is sponsored by the University of Minnesota system wide Career Services offices.

**What can I do with GoldPASS?**
- Post your resume!
- View and search job, internship, and volunteer listings
- Register for career fairs
- Schedule interviews

In order to use GoldPASS, you'll need to log in with your x.500 ID (Internet ID) and complete the new user agreement. **Log-in here** [http://goldpass.umn.edu/](http://goldpass.umn.edu/)

For answers to common questions, refer to the GoldPass FAQs: [https://goldpass.umn.edu/FAQs%209.10.pdf](https://goldpass.umn.edu/FAQs%209.10.pdf)

Many recruiters preselect students for interviews using GoldPASS. Don’t let an employer pass you by – register on GoldPass TODAY!
CHEMCAD Installation and License Key

Installation instructions for CHEMCAD System Authorization Educational Licenses: (For Windows PCs). You must be a member of the faculty, staff, or a student in the Chemical Engineering program to access CHEMCAD on your personal or office computer.

1. Obtain a copy of the installation file from the department computers located in Engr 270. To locate the file, click on the short cut named CHEMCAD Installation File, located on the Windows desktop. Copy the installation file (CHEMCAD_##_Setup.exe) from the folder to your portable flash drive.

2. Copy the installation file from your flash drive to your Windows PC desktop. Double click the file to install CHEMCAD on a ChE faculty/staff/student PC. (Mac users may need to install Windows using BootCamp to run CHEMCAD.)

3. After installation, select Start > All Programs > Chemstations > CHEMCAD.

4. When a dialog box appears stating that a license cannot be found, click the Setup button.

5. In the License Setup dialog box, click the System Authorization button.

6. Move your mouse pointer to the System Key field. Right-click and choose Select All, then right-click again and choose Copy.

7. Close all CHEMCAD windows, and then open your preferred e-mail program.
8. Create a new message and send it to Julie DeRoche (jdroch1@d.umn.edu). Put “CHEMCAD License Request Your First Initial and Last Name” in the subject line and paste your system key number into the message body (note, each computer has a different system key). Indicate that you are requesting educational authorization and include your full name (See example below).

9. Julie will verify your status as a ChE student, faculty, or staff and obtain a system authorization number.

10. Copy this number to your Windows clipboard using the Copy command and then start CHEMCAD again.

11. When the licensing dialog box appears, click Setup and then System Authorization. Right-click in the User License Key field and select Paste. A message appears confirming validity.

12. Click OK to close the dialog box and Continue to access the main CHEMCAD window.
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