**Department of Chemical and Biological Engineering**

# Academic Advising Help Guide

2013-2014

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# Welcome to the Department of Chemical and Biological Engineering

Welcome to the Department of Chemical and Biological Engineering (ChBE) at CU Boulder. We are looking forward to helping you have a fulfilling and rewarding time while studying Chemical and Biological Engineering here!

The Department offers two undergraduate degree programs, a Bachelor of Science (BS) in Chemical Engineering (CHEN) and a Bachelor of Science in Chemical and Biological Engineering (CBEN). Both degrees provide excellent training in traditional chemical engineering fields, with the CBEN degree offering additional targeted training in biological engineering .

This document provides Academic Advising information; Chemical Engineering Degree curricula, options, and requirements; Chemical and Biological Engineering Degree curricula, options, and requirements; a list of resources frequently accessed by students during their collegiate careers; and a list of frequently asked questions (FAQs) and answers.

The standard CHEN curriculum (including bioengineering, energy, environmental, and materials options), the curriculum for the CBEN degree and the pre-medicine curricula are outlined in this document.

## Mission and Vision of the Undergraduate Program

### Mission Statement of the Undergraduate Programs in Chemical Engineering and Chemical and Biological Engineering

The Department of Chemical and Biological Engineering at the University of Colorado seeks to instill in its students an education in the principles and practice of chemical engineering or chemical and biological engineering that will serve a broad and dynamic range of career paths and provide a foundation for lifelong professional growth.

The mission of the University of Colorado at Boulder is to lead in the discovery, communication, and use of knowledge through instruction, research, and service to the public.

The mission of the undergraduate programs in Chemical Engineering and Chemical and Biological Engineering at the University of Colorado at Boulder is consistent with the institutional mission, and our fundamental focus is to collaborate with you in meeting your needs and preparing you for a rewarding and fulfilling career after graduation.

Our undergraduate program is a blend of chemical engineering principles and chemical and biological engineering principles and practices. This approach equips you with tools and skills that are immediately useful in the workplace you decide to take your professional track.

Our program is broad in nature and is designed to prepare you for a wide range of career paths and career changes. The program also recognizes the learning that will be ongoing during your career, so you develop analytical skills with lifelong learning as a focus.

The University of Colorado is a research institution. The Department of Chemical and Biological Engineering offers you involvement in research programs, either for academic credit (Independent Study, Senior Thesis) or for pay (Undergraduate Research Opportunities Program, Research Experiences for Undergraduates Program). These opportunities are also consistent with the University's mission. Approximately 70% of our undergraduate students partake in some sort of undergraduate research opportunity during their time here.

The University of Colorado at Boulder is a large institution with many benefits associated with this size and the Department of Chemical and Biological Engineering strives to provide you a friendly environment where you are known, guided, and cared for. We have an open-door atmosphere throughout the Department, which will help you experience a warm and inclusive environment where you can freely express your thoughts, ideas, and concerns. And, a place where you can get the support you might periodically need.

## Chemical Engineering and Chemical and Biological Program Objectives, Outcomes, and Curricula

### Program Objectives

The department prepares you to make significant contributions in many diverse areas. Specifically, within three to five years you will:

- → be recognized as academic and industrial leader in a multitude of chemical engineering or chemical and biological engineering or related fields;
- → demonstrate the relevant technical, critical thinking, and problem solving skills and creativity required to solve challenging and open-ended problems;
- → work and communicate with a diverse group of individuals in interdisciplinary areas;
- → exhibit high ethical standards and moral responsibility necessary to safely protect public health and the environment and be knowledgeable of contemporary issues that face modern society;
- → demonstrate an interest in and the pursuit of life-long learning and possess the versatility necessary to adapt to a rapidly changing professional environment by applying their skills to new and developing technologies.

### Program Outcomes

At the time of graduation, you will demonstrate:

- → an ability to apply knowledge of mathematics, science, and engineering;
- → an ability to design and conduct experiments, as well as to analyze and interpret data;
- → 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;
- → an ability to function on multidisciplinary teams;
- → an ability to identify, formulate, and solve engineering problems;
- → an understanding of professional and ethical responsibility;
- → the appropriate written and verbal communication skills required to communicate effectively;
- → the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;

- → a recognition of the need for, and an ability to engage in life-long learning;
- → a knowledge of contemporary issues;
- → an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;
- → an ability to apply engineering to biological systems (CBEN degree);
- → a knowledge of advanced biological concepts (CBEN degree).

## Chemical Engineering (CHEN) Curriculum

The CHEN Bachelor of Science Degree offers two curricula and four options:

- → Standard Chemical Engineering Curriculum
- → Pre-medicine Curriculum
- → Bioengineering Option
- → Energy Option
    - o Biofuels Focus
    - o Fossil Fuels and Petroleum
    - o Photovoltaics
- → Environmental Option
- → Materials Option
- → Cooperative Education Study Plans

The courses of the CHEN curricula (128 total credit hours) are divided into four categories:

- → Required technical courses (88 total credit hours)
- → Technical and chemistry electives (18 total credit hours)
- → Humanities and Social Science courses, including electives (18 total credit hours)
- → Free electives (4 total credit hours)

The Standard Chemical Engineering curriculum provides you the most freedom in the choice of your technical elective courses. The option curricula structure the technical elective courses to fulfill the theme of the particular option you've selected. The pre-medicine curriculum satisfies the typical requirements for admission to medical school.

The above credit hour totals are minimum requirements. Most students complete their degree programs with a few more credit hours. This is due to changing majors, transferring into Chemical Engineering or Chemical and Biological Engineering from outside the College of Engineering and Applied Science or from outside CU, taking additional credit hours in areas of interest, other requirements, such as Presidents' Leadership Class, ROTC, residence hall programs, or encountering academic difficulty.

The Department of Chemical and Biological Engineering follows the policies of the College of Engineering and Applied Science as far as credit-toward degree for PLC, ROTC, and other courses. All curricula are accredited by the Engineering Accreditation Commission of ABET (ww.abet.org).

## Chemical and Biological Engineering (CBEN) Curriculum

The **CBEN** Bachelor of Science Degree offers two curricula:

- → Standard Chemical and Biological Engineering Curriculum
- → Pre-medicine Curriculum (129 total credit hours)

→ Cooperative Education Study Plans

The courses of the **CBEN** curricula (128 total credit hours) are divided into three categories:

→ Required technical courses (94 total credit hours)
→ Technical electives (12 total credit hours)
→ Humanities and Social Science (H&SS) courses, including electives (18 total credit hours)
→ Free electives (4 total credit hours)

The standard CBEN curriculum provides students the most freedom in the choice of technical elective courses. The pre-medicine curriculum satisfies the typical requirements for admission to medical school.

The Department of Chemical and Biological Engineering follows the policies of the College of Engineering and Applied Science as far as credit-toward degree for PLC, ROTC, and other courses. All curricula are accredited by the Engineering Accreditation Commission of ABET (www.abet.org). Humanities and Social Science courses must be selected following the policy of the College of Engineering and Applied Science for the year in which you started at CU. This policy is included in this Guide.

The above credit hour totals are minimum requirements. Because of varied student interests and backgrounds, most students do not follow any one of the curricula exactly. Most students complete their degree programs with a few more credit hours. This is due to changing majors, transferring into Chemical Engineering or Chemical and Biological Engineering from outside the College of Engineering and Applied Science or from outside CU, taking additional credit hours in areas of interest, other requirements, such as Presidents' Leadership Class, ROTC, residence hall programs, or encountering academic difficulty.

# Academic Advising Information

Academic advising is the process in which you and your advisor work together to set goals for your academic, professional, and personal life. It is a collaborative process and ultimately you are responsible for your educational experience. Higher education has the potential to change your life for the better if you set goals and strive to achieve them. As you pursue your degree, you have the power to make changes that will set the course for a lifetime of learning. Our hope is that we can help you set those goals and encourage you to pursue and reach them. You will be in charge of reaching those goals, and we will help in whatever way possible.

## Your Responsibilities

You should

- → Check your colorado.edu email regularly. This is the only email your advisor will use. Furthermore, most of your classes will send course-related email to your colorado.edu email.
- → Include the last 4 digits of your SID on all email to your advisor.
- → Keep a record of your academic progress and goals.
- → Be familiar with the course sequencing in your program.
- → Arrive on time for your advising appointments.
- → Reschedule your appointment as soon as possible, if something comes up.
- → Understand you're in charge of your actions and decisions.
- → Be open to developing and clarifying your personal values and goals.
- → Familiarize yourself with the academic calendar and deadlines.
- → Ask questions if you need information or if something is unclear.
- → Understand that accuracy for your academic plan is ultimately your responsibility.

## Your Academic Advisor's Responsibilities

Your academic advisor will:

- → Understand and communicate curriculum, requirements, policies, and procedures.
- → Assist you in making course and option decisions.
- → Assist you in understanding the purposes and goals of higher education.
- → Be accessible to you during posted office hours by email and/or phone.
- → Provide a safe place where you can share your thoughts, aspirations, concerns, and interests.
- → Provide resources, referrals, and strategies for using other campus resources.
- → Listen to your concerns and respect your individual values and choices.
- → Encourage and support you as you gain the skills and knowledge necessary for success.
- → Assist you in creating an educational plan that is consistent with those goals.
- → Help you find balance with your academic, social, and personal activities.

You will meet at least once a semester with your academic advisor to check your academic progress, to check in how you're doing overall, and to remove any holds that would prevent you from registering for the upcoming semester.

You can schedule consultations with your advisor throughout the year and during summer sessions. These consultations will be used to address issues that may not have to do with registration, but could impact your tenure here or your selection of courses, majors, minors, etc.

To schedule an appointment with your advisor, please use the online system at http://advising.colorado.edu/.

## Frequently Needed Advising Information

You'll use the following terms and processes numerous times while you're in college here, so you should become familiar with them.

**Matriculation:** The date you were first enrolled at CU Boulder is your matriculation date. This is important because you will follow the catalogue and course requirements starting from your matriculation date for your entire college career at CU Boulder.

**Holds on Records:** The Department of Chemical & Biological Engineering automatically places a hold on your records each semester to ensure you meet with your advisor prior to registering for classes. Once you have met with your advisor, the hold will be lifted from your record and you will be able to register for classes. A scholastic, dean's, financial, or health hold may be placed on your record for a number of reasons. A hold prevents you from registering, returning to school, obtaining an official transcript, or receiving a diploma. You should resolve each hold as quickly as possible by contacting the campus office that placed it. General inquiries may be addressed to the Office of the Registrar.

**Prerequisites:** Prerequisite courses are courses that must be taken prior to taking some advanced courses.

**Co-requisites:** Co-requisite courses are courses that must either have been taken or are being taken concurrently with other courses. An example of a co-requisite course combination is CHEN 1211 Chemistry for Engineers and CHEM 1221 Engineering General Chemistry Lab.

**Drop/Add:** You have 10 weeks to drop a class by going to your myCUinfo portal. Please see the current drop/add deadlines at http://registrar.colorado.edu/calendar/calendars_schedules.html.

**Petitions for Courses:** You must petition for courses taken at other colleges or universities by completing a petition and supplying a syllabus and catalogue course description. If you are planning on taking a course at another institution say over the summer, you must complete the petition process **prior** to taking the course to avoid the possibility of learning after the fact the course will not count toward your degree requirements.

**Petitions for Credit Hours:** You must petition to take less than 12 credit hours (fall, spring, or summer) and more than 19 credit hours (fall, spring, or summer).

**Intra-university Transfer (IUT):** Please see the college Intra-university requirements at http://www.colorado.edu/engineering/admissions/transfer/Intra-university

**Graduation:** To receive a BS degree in CHEN or CBEN from the University of Colorado, you must complete one of the curricula published in this Guide, comprising a minimum of 128 (129 for CBEN pre-

med) semester credit hours, and your CU cumulative grade point average (GPA) must be 2.25 or greater. You must also achieve a grade of C- or better in all CHEN courses (CHEN 2120 requires a C or better for students who matriculated in fall 2011 forward) specifically required for graduation and your cumulative GPA in CHEN courses must be 2.25 or greater. The Department recommends all graduating seniors take the Fundamentals of Engineering (FE) or GRE exam. The Department will retroactively pay one third of the cost of the exam once the exam is completed.

## AP/IB Credits

You can check how your AP and IB scores transfer in using the AP Credit and IB credit links.

If you have additional questions or would like more information, please contact the Admissions Office at mycuboulder@colorado.edu or 303.492.6301.

### Technical and Free Elective Requirements

As part of the CHEN curriculum, students must take 16 credit hours of technical elective courses and 4 credits of free electives. If the one-credit CHEN 1300 Chemical Engineering course is taken, only 15 credits of technical electives are required.

The CBEN curriculum requires 9 hours of technical elective courses and 4 credit hours of free elective courses. If CHEN 1300 is not taken, then 10 hours of technical elective credit must be taken.

In some of the option tracks, certain technical elective and/or free elective courses are required. For example, in the Energy Option, GEOL 1010 is required for the option and counts as a technical elective. Please talk with your advisor or see the curriculum charts in this document below for more information. The technical and free electives provide you the opportunity to explore areas of personal interest and to develop strength in specialty areas of your choosing. You must select your technical and free elective courses within the bounds of the requirements stated below.

## Technical Elective Requirements

1. A list of approved technical electives is available at Tech Electives.
2. CHEN majors must complete a minimum of 16 credit hours of approved technical electives. Six of those credit hours must be CHEN 3000+.
3. CBEN majors must complete a minimum of 13 credit hours of approved technical electives. One focus technical elective must be one of the following: CHEN 4801 Pharmaceutical Biotechnology, CHEN 4803 Metabolic Engineering, or CHEN 4838 Tissue Engineering/Biomedical Devices.
4. Any deviations from approved technical electives (which are rare) must be approved by the Department's Variance Committee.
5. Independent Study counts as a technical elective. Chemical Engineering and Chemical and Biological Engineering students are encouraged to have at least one Independent Study experience by working closely with a faculty member on a research or design project. You can speak with faculty members about the research they are involved in and express interest in working with them. You may apply at the most 6 credits of Independent Study towards technical elective credit (3 credits of lower level, 3 credits of upper level).

## Free Elective Requirements

Free elective courses may be chosen from either the technical category or the Humanities and Social Science category. Free elective courses may also include skills courses, such as foreign language grammar and composition, basic drawing, photography, and music performance. In this way, you may choose to give your curriculum a heavier technical or humanistic emphasis.

You should note that not every class counts towards your free elective credits. For example, credit hours in pre-calculus mathematics, preparatory chemistry, and preparatory physics, required by the University's Minimum Academic Preparation Standards (MAPS) policy, cannot be used for free elective credit. Be sure to consult with your advisor on your choice of free elective courses. Note: You may take free elective courses on a pass/fail basis if they are 3000-level or above and not engineering courses. See the Q&A section of the document.

## Humanities and Social Science Requirements

Your Humanities and Social Science (H&SS) courses comprise a vital component of your undergraduate education. You should see these courses as an opportunity to expand intellectually in new and exciting directions. Many students find that their H&SS courses provide a beneficial balance to their technical curriculum. You should make an overall plan for these courses in consultation with your advisor and other sources of assistance. Some of these courses can be used as a grouping to count toward a minor, an International Engineering Certificate, or other special situation.

The Department of Chemical and Biological Engineering abides by the requirements of the College of Engineering and Applied Science for humanities and social science courses found at http://www.colorado.edu/engineering/academics/policies/hss.

1. You are required to complete 15 credit hours of approved H&SS courses (see approved courses at link above).
2. At least 6 credit hours must be taken at the 3000+ level.
3. In addition to the 15 credit hours of H&SS courses, you are required to complete a writing course. You can take HUEN 1010 during your first year in the University if you enrolled in fall 2011 or later. Otherwise, you can take either HUEN 3100, WRTG 3030, or WRTG 3035.

## Herbst Program of Humanities

Through a generous endowment from Clancy Herbst, Jr. (ChE, '50), the College of Engineering and Applied Science is able to offer to a small number of its students a specialized program in the humanities. The Herbst Program of Humanities offers a number of courses to engineering students. Notable among these is the 2-course, Junior-level seminar courses, Humanities for Engineers 1 and 2 (HUEN 3100 and 3200). Admission to these courses is by application during the spring semester of your sophomore year.

All courses in the Herbst Program are approved H&SS courses. Classes in the Herbst Program are different from your other courses. Class meetings are in the form of moderated discussions in group settings, generally with 12 students and a faculty moderator. Frequent writing assignments help you

learn to write lucidly and to find the expression of intellectual discipline in good writing. The writing of students in the Herbst Program has been acclaimed by engineering educators around the U.S.

The small-group setting creates a community of learning. Seminar moderators do not seek to impart textbook knowledge to you. Instead, all participants share in discussions of original masterpieces from the various fields of human achievement. The readings extend from Homer to Einstein and include Dante, Descartes and the Federalist Papers, among others. Works of art and music may also be studied. Students learn to examine their own convictions, to listen attentively and respectfully to the opinions of others, and to engage in a conversation that leads away from having unreflected points of view to a responsible consideration of ideas. In doing so, it also helps you develop skills of unquestionable practical value: speaking, writing, and thinking critically.

These skills carry far beyond the study of the humanities. You gain a broader view of what there is to know and a deeper understanding of what it means to know. The program encourages a flexibility of mind which engineers, like other skilled professionals, require in a rapidly changing technological and social environment. Finally, the program helps liberate the creative imagination that is essential in the highest reaches of engineering design and leadership.

For additional information, contact the Herbst Program office in the Lesser House, 5-2444.

## Research Opportunities

The Department of Chemical and Biological Engineering has active research programs in biotechnology and tissue engineering, biosensing, bioengineering and pharmaceuticals, catalysis and surface science, computational science and engineering, energy, fluid and flows,interfaces and self-assembly, membranes and separations, nanomaterials and nanotechnology, polymers and soft materials, and protein engineering and synthetic biology. This research has traditionally been undertaken by the faculty, graduate students, and visiting researchers. More and more in recent years, however, undergraduate students are making significant contributions to the research and creative work of the Department.

Undergraduate students may participate in research in a variety of ways. One way is to enroll in an independent study project under the supervision of one of our faculty. Typically, a 3 credit hour independent study project will require 9 hours of research work per week. The independent study project course counts as a technical elective.

Another way is to work on a project for pay on an hourly basis, either part time during the academic year or full time during the summer. Many faculty members have research grants specifically designed to support undergraduate students, such as those provided by the National Science Foundation's Research Experience for Undergraduates Program. You may also find a research position through application to the College of Engineering’s Discovery Learning Apprenticeship Program. You can apply for financial assistance through CU's Undergraduate Research Opportunities Program (UROP) or the Undergraduate Research Assistantships Program of the Biological Sciences Initiative (BSI).

Independent study and research opportunities are circulated frequently via email or posted on bulletin boards or outside faculty offices. These opportunities allow for individual contact with faculty and graduate students, and they provide an educational experience that cannot be obtained in the

traditional classroom setting. Undergraduate students are strongly encouraged to take advantage of these opportunities, especially if interested in graduate study or a research career.

### Senior Thesis Option

The Department of Chemical and Biological Engineering offers a Senior Thesis Option. Selected students work for two semesters at 2 credit hours per semester on a research project under the supervision of a faculty member, with oral presentations and written reports required.

This two-semester sequence may be substituted for Chemical Engineering Laboratory 2 (CHEN 4130). In order to qualify, students must first complete Chemical Engineering Laboratory 1 (CHEN 3130) with a grade of B or better, have a cumulative grade-point average of at least 3.30, develop a project that is endorsed by a faculty research advisor, and receive the approval of the Department's Senior Thesis Committee. Please see the Senior Thesis Application.

## Special Programs of Interest

### Engineering Leadership Program

The College of Engineering and Applied Science is proud to offer students an opportunity to study, experience, and observe leadership to prepare them to be future leaders. Engineers can make a world of difference through their chosen careers. Equipped with technical knowledge and analytical and problem-solving skills, they have the know-how to create things that make the world a better place. Through the Engineering Leadership Program, engineering undergraduates with strong leadership skills and experience can distinguish themselves by obtaining an Engineering Leadership Certificate upon graduation. Check out the program at http://www.colorado.edu/engineering/leadership/.

### Engineering Management Certificate or Entrepreneurship Certificate

Engineering Management and Entrepreneurship offers two undergraduate certificates designed to equip young leaders in engineering and sciences with essential business skills. For information about the Management Certificate Program, contact seth.murray@colorado.edu. For information about the Entrepreneurship Certificate Program, contact erick.muller@colorado.edu.

### Study Abroad

Through the Office of International Education, the University of Colorado offers a variety of study abroad programs. Many Chemical Engineering students have participated in study abroad programs over the years. These programs can provide a tremendous broadening experience. CHEN and CBEN students participate in two categories of study abroad programs.

The first category is the general language-and-culture-based program which has broad-based participation by CU students. Example programs of this type include Alicante (Spain) and Regensburg (Germany). The second category of program is where the engineering and science courses are taken in the foreign country and transfer to apply to the chemical engineering degree. Examples are Monterrey (Mexico) and Sydney (Australia).

Contact the Office of International Education, ENVD 1B45, 2-7741, more information is available here http://studyabroad.colorado.edu/. Students planning to study abroad should conduct an advising meeting with David Clough (david.clough@colorado.edu) prior to departure.

## Second Degree and Minor Programs

Many students in engineering wish to complete another degree program concurrently at CU Boulder. This is possible but generally takes one additional academic year of study. Additionally, you must complete 30 credit hours beyond the 128 required for your Bachelor's Degree in Chemical Engineering and satisfy all the requirements of the second degree program. If the latter is in the College of Arts & Sciences, you must complete the A&S general education core.

## Student Professional and Honorary Societies

Many students find it most rewarding to participate in various professional and honorary societies. Those most common to Chemical Engineering students are listed below.

### American Institute of Chemical Engineers – AIChE

The main chemical engineering society is the American Institute of Chemical Engineers (AIChE). The University of Colorado student AIChE chapter provides various opportunities and experiences for chemical engineering students. Invited speakers at chapter meetings include practicing professionals as well as faculty and graduate students. Field trips and social events are sponsored by the chapter. The objectives of AIChE are to promote professional development and ethics of its members as well as to contribute to the variety of the chemical engineering program at the University of Colorado. Student members are given opportunities to meet their professors, other students, and other members of the chemical engineering profession in informal settings. Meetings provide discussion of career choices, graduate school, research and professional experiences. Student members may also purchase Perry's Handbook of Chemical Engineering at a discount through the AIChE student chapter. Meetings and activities normally take place twice per month. The group sends out emails with meeting information throughout the year. If you have any questions, contact the AIChE student chapter in ECCR 213. Their phone is 2-6528. The names and phones of this year's chapter officers and faculty advisor are available through the Departmental office.

### Society of Women Engineers – SWE

The Society of Women Engineers is a professional, non-profit, educational service organization of women and men who are dedicated to the advancement of women in the engineering profession. SWE was officially incorporated in 1952, when female enrollments in engineering were less than 1%, to provide support and encouragement for women pursuing engineering and science careers. Current female enrollment nationwide in engineering is about 17% and much higher than that in chemical engineering. The SWE student chapter at the University of Colorado is dedicated to providing a social/support group as well as an opportunity to make contacts with faculty and professionals. Meetings include speakers on such topics as technical matters and career development. Social events are scheduled frequently to give members a chance to meet their peers and get involved. As well as supporting its student members by providing academic assistance, SWE also encourages young women to pursue engineering and science careers by visiting several junior high and high schools in the Denver area. The SWE student chapter is also supportive of the College's Women In Engineering Program (WIEP). Other benefits to members include scholarships, exam files, a library of literature on many companies, workshops, industry tours and talks, a national convention, and more. Membership applications are available from the SWE office, ECCR 217, 2- 7580. The names and phones of this year's officers can be obtained through the Dean's Office.

### Biomedical Engineering Society – BMES

The University of Colorado student chapter of the Biomedical Engineering Society is open to all disciplines. Students are given the opportunity to learn more about biomedical engineering and the biotechnology field at the society's meetings, where speakers from local businesses and the University discuss their research and professional interests. Members also meet fellow students and professors through society-sponsored functions, such as the annual Fall picnic and Spring cross-country ski trip. The society also sponsors several trips each year to local companies and research labs. Meetings are held

once per month. To find out more, contact BMES in their office, ECCR 213, 2-6528. The names and phones of this year's chapter officers and faculty advisor are available through the Departmental office.

### Omega Chi Epsilon

Omega Chi Epsilon is the chemical engineering honor society and promotes scholarship and achievement as well as service to the profession. This honorary society was founded at the University of Illinois in 1931. The University of Colorado chapter is active in student relations and community service. To be considered for membership, students must have junior standing, rank in the upper 20% of their class, or senior students must rank in the upper 30%. They must also have completed six credit hours of chemical engineering courses. In addition, members must possess those traits of personality and leadership that make them most likely to succeed in their chosen field of endeavor. Initiation ceremonies are held during both the Fall and Spring semesters.

### Tau Beta Pi

Tau Beta Pi is the honorary society for all engineering students. Juniors in the top 1/8$^{th}$ and seniors in the top 1/5 of their class are invited to join this prestigious honorary. The Colorado Beta chapter has been active since 1905 and was one of the first chapters in the nation, out of more than 200. Tau Beta Pi sponsors $7,500 national fellowships for graduate study. In 1992, a student from the Colorado Beta chapter was awarded one of these fellowships. The chapter projects and activities include canned food drives in collaboration with Boulder County, holiday decorations at a local manor care home, weekend ski trips, intramural sports, an alumni newsletter, free movies, human-powered sculpture racing, and many more. The yearly district conference is held in Estes Park and draws students from all over the Rocky Mountain region. Chemical engineering students are well represented and have assumed leadership positions in recent years. The office is in ECCR 215 and their phone is 2-8665. The names and phones of this year's officers can be obtained through the Dean's Office.

## Campus Resources

Helpful links:

- → The Registrar's website http://registrar.colorado.edu/index.html
- → Undergraduate Advising Forms http://www.colorado.edu/engineering/academics/advising-and-registration
- → Applying for Graduation http://registrar.colorado.edu/students/graduation.html

You should be familiar with the use of the information system on the CU-Boulder website www.Colorado.edu. Advising and counseling outside of the Department of Chemical and Biological Engineering can be obtained from the following sources:

**General College of Engineering Advising**
Dean's Office, ECAD 100, 2-5071
Engineering Ambassadors, ECCR 262, 2-0828
Specialized College of Engineering Advising

**General and Financial Aid Issues for Minority Students**
Multicultural Engineering Program, ECCE 100, 2-6606

**Women's Issues**
Women in Engineering Program, ECCE 100, 2-0083

**Professional Counseling on Personal Matters**
Counseling and Psychological Services, Center for Community, Room, S440, 303.492.6766

**Career Counseling**
Career Services, Center for Community, 2249 Willard Loop Drive, Room N352

**Medical Consultation, including psychiatric**
Wardenburg Health Center, 303-492-5101

**Financial Aid Issues**
Office of Financial Aid, Regent 175, 2-5091

## Frequently Asked Questions

Q: I took MATH 1300 instead of APPM 1350 before I transferred to ChBE. Do all 5 credit hours from MATH 1300 apply to the 128 credit hours required for my B.S. degree?
A: No. Since most students take the 4-credit-hour APPM 1350, you cannot arbitrarily increase your calculus credit hours and reduce the other requirements of your curriculum. Only 4 of the 5 credit hours from MATH 1300 will apply to your 128 credit hour requirement, although your transcript will reflect the 5-credit-hour course and your GPA will be calculated using 5 credit hours.

Q: I had a full year of English composition at another college before I transferred to CU. Do I still have to take WRTG 3030?
A: Generally, yes. WRTG 3030 is considered to be an advanced-level composition course. Lower-level English composition courses or equivalent AP credit will not satisfy the WRTG 3030 requirement.

Q: I have an opening in my sophomore year schedule. Can I take the WRTG 3030 course during my sophomore year rather than waiting until my junior year?
A: No, unless you have more than 60 credit hours completed already. Upper-division standing (junior or senior) is required for this course.

Q: I have AP credit for both CHEM 1113 (4), CHEM 1114 (1) and CHEM 1133 (4), CHEM 1134 (1), a total of 10 credit hours. Do all these credit hours apply to the 128 credit hours required for the B.S. degree in ChE?
A: Possibly. A score of 4 on the AP Chemistry exam will count for CHEM 1113/1114 (5) ONLY but a score of 5 will count for CHEM 1113/1114 (5) and CHEM 1133/1134 (5). Since the Standard Curriculum allows only for the 5-credit-hour Chemistry for Engineers course (CHEN 1211/CHEM 1221), any substitute may only apply 5 credit hours toward this requirement. However, it is possible to count the additional 5 credit hours as free elective credit. You are still required to complete an advanced chemistry elective. If you follow one of the options where all free electives are specified, then the additional 5 credit hours for general chemistry will be add-on credit.

Similarly, if you have taken CHEM 1113/1114 (5) and CHEM 1133/1134 (5) (many transfer students from Arts and Sciences are in this boat), you may apply 5 credits toward CHEN 1211/CHEM 1221 and the remaining 5 credits can be applied toward free elective credit.

Q: Pre-med requirements include a full year of general chemistry. Since Chemistry for Engineers is only 5 credit hours and one semester, what should I do?
A: To ensure your eligibility for medical school, you should take CHEM 1133/1134 (5) at some point during your undergraduate program. You will not be allowed to take CHEM 1113/1114 (5) as an engineering student. You must take Chemistry for Engineers (CHEN 1211/CHEM 1221) as your first general chemistry course.

Q: Are the prerequisites enforced for all courses?
A: The Department of Chemical and Biological Engineering does enforce prerequisites for all CHEN courses. For courses in other departments, you are advised strongly not to take courses whose prerequisites you have not satisfied. If you do not satisfy a prerequisite, you must petition in that department to stay in the course.

Q: How do I determine what the prerequisites are for a course?
A: The Boulder Campus CU catalog (http://www.colorado.edu/catalog/2013-14/) lists prerequisites with the course descriptions. The curriculum checklist forms in this Guide show prerequisites for the required courses of the curriculum.

Q: When have I satisfied a prerequisite requirement?
A: By taking the prerequisite course and achieving a grade of C- or higher. If you received a grade lower than C- in the prerequisite course, you must retake that course. CHEN 2120 Material and Energy Balances requires a grade of C or better for students who started in the program in Fall 2011 or after.

Q: Do I have to achieve a grade of C- or higher in all my CHEN courses that are specifically required for graduation?
A: Yes, and your GPA in all CHEN courses must be 2.25 or greater.

Q: I recently changed majors to ChE during the fall of my sophomore year, and I missed taking Chemical Engineering Material & Energy Balances (CHEN 2120). Does that put off my graduation by an entire year?
A: Not necessarily, but it is likely to put it off by at least a semester. You will probably take CHEN 2120 in the spring and MCEN 3021 (Fluids) the next fall. Also, CHEN 3200 (Fluids) is oftentimes offered in the summer semester.

Q: I've heard that it is impossible to complete the B.S. program in ChE in four years and that all students take at least 4-1/2 and many take 5 years.
A: Not so. The curriculum is designed to be completed in 4 years, and we encourage you to do so. We cannot, however, require you to do so. Some students do take longer to complete their degree. Reasons for this vary, but include other demands on the student's time require reduced academic loads, by transferring or changing majors partway through the program, the student has a curricular mismatch, academic difficulty requires the student to repeat one or more courses, and the student wants to explore academic areas outside of the standard CHEN or CBEN curriculum.

Q: How are MAPS deficiencies handled in the context of the ChE curriculum?
A: Minimum Academic Preparation Standards (MAPS) are state-mandated requirements placed on the academic preparation you received in high school and prior to entering CU, and they are graduation requirements. If you have any MAPS deficiencies, you must remedy them before graduation.

University policy requires that you remedy deficiencies by taking appropriate courses, at least one course per semester upon entering CU. That may mean that your progress in the ChE curriculum will be altered or delayed because of the requirement to remedy MAPS deficiencies. There are cases, e.g., foreign language courses, where the course(s) you take to remedy a MAPS deficiency can actually count toward your B.S. ChE degree program. However, there are also situations, e.g., MAPS deficiencies in math, where the preparatory courses taken to remedy the deficiencies will not count toward your degree. It is most important to consult an advisor regarding MAPS deficiencies.

Q: I received notice of academic suspension after my freshman year. What am I supposed to do? I want to continue studying at CU in the fall.
A: Suspension is just that, and it normally lasts one semester and a summer. The University is sending you a very strong message: we do not believe, given current evidence, that you can be successful in

your present course of study. For most students, it is best that they take a break from all academic pursuits and spend a considerable amount of time re-evaluating their situation. Such absence and reflection may lead to a change of plans, or, less frequently, to a return to the University after the suspension with a different focus and attitude.

You can take courses at another institution during a suspension. However, the grades earned will not impact your CU GPA even though the credits may appear on your CU transcript. It may be necessary for you to improve your CU GPA before you attempt to return to CU, if your suspension was due to a GPA below 2.250. You may do this by taking summer term courses or correspondence courses only.

Q: What types of courses can I take in the summer term?
A: The foundation courses in the sciences and mathematics and a variety of humanities & social science courses are available in the summer term. There are also several sections of the WRTG 3030 course offered, and the Herbst seminar courses, HUEN 3100 and 3200 have been offered in recent years. A few engineering courses may be available, e.g., GEEN 1300 and CHEN 3200.

Q: I have been put on probation. As a result, I may lose my financial aid. Can I meet with my last semester's instructors and ask them for grade changes so that I can get off probation retroactively?
A: The only justification for asking an instructor for a grade change is that an error has occurred in assigning your grade for that course. It is unfair to approach an instructor, asking for a change of grade, when it is based on a circumstance external to the course, such as probation, suspension, or loss of financial aid. You are putting the instructor in an unfair position. Don't do it. You may ask for an IF grade during the semester if an external circumstance beyond your control, e.g., a medical condition, has affected significantly your ability to complete the course.

Q: The semester is half over. My course workload seems to be too much. I need drop a couple courses. What do I do?
A: You can drop a course up to the 10th week of the semester via your myCUinfo portal. It is strongly recommended you check in with your academic advisor before dropping any classes. Please see the complete drop policy here:
http://registrar.colorado.edu/students/registration/registration_packet/drop_add.html.

**Repeat Rules**

On March 5, 2009, the Boulder Faculty Assembly voted to eliminate the Course Repetition Program on the Boulder Campus. Students will be able to repeat courses under the course repetition program only through the summer semester of 2010. Beginning in the fall of 2010, all grades will be employed to calculate the grade point average, including any courses which are repeated.

Q: I am having a real problem with an instructor. I feel as though I'm being harassed unfairly by this individual, but since s/he controls my grade in the course, I'm afraid to complain about it.
A: This is always a tricky area. Your feeling of harassment may be the result of a miscommunication with the instructor. If you can possibly do it, you should discuss your feelings with the instructor. That will often take care of the matter right away. If you feel uncomfortable about doing this alone with the instructor, ask a friend to accompany you. You may also wish to contact the Ombudperson's office or a faculty advisor on the matter.

Q: I missed taking Biology for Engineers my freshman year. Are there alternate courses I can take in the summer or fall to fulfill this requirement?
A: The Biology for Engineers requirement can be satisfied in several ways. A 4 or 5 on an AP/IB biology exam will meet the course requirements. MCDB 1150 (offered in the fall) would also be equivalent. Students looking for a summer course can take the two-semester sequence EBIO 1210 and 1220.

Q: Can I take courses on a Pass-Fail basis and have them apply to the 128 credit hours required for graduation in ChE?
A: Yes, the Department policy is that any course that is not specifically required for graduation, is taught outside the College of Engineering and Applied Science, and is at the 3000 level or above, may be taken on a Pass-Fail basis. You must also follow the College of Engineering guidelines on Pass-Fail courses: no more than 16 credit hours of Pass-Fail total. Note: advanced chemistry technical electives and electives specified for the options may not be taken Pass-Fail.

Q: If I receive a D+ in a course that is a prerequisite for another CHEN course, do I have to take that course again?
A: Yes, a grade of C- or better is required in a course that is a prerequisite for another CHEN course (CHEN 2120 requires a C or better for students starting the program in the fall of 2011 or later).

Q: Fundamentals of Environmental Engineering (CVEN3414) for the environmental option curriculum is listed as a course that I need to take in the spring of my sophomore year. However, it is only offered now in the fall.
A: You should take Fundamentals of Environmental Engineering (CVEN3414) in the fall of your junior year and instead take an environmental engineering elective during the spring of your sophomore year.

Q: Does PHYS 3070 (same as ENVS 3070) count as an environmental tech elective?
A: No, this class does not fulfill the requirements for a technical elective in the environmental engineering option.

Q: Is there a list of all the technical electives that I can take?
A: Yes, the list can be found here: http://www.colorado.edu/chbe/

Q: Do APPM 1340 and APPM 1345 count as a replacement for APPM 1350?
A: Yes, APPM 1340 and APPM 1345 together satisfy the requirements for APPM 1350. It is HIGHLY RECOMMENDED that a student who has taken these two courses as a freshman take APPM 1360 over the summer after his/her sophomore year in order to catch up on their math (APPM 1360 is usually taken during the student's freshman Spring semester). Otherwise, the student will fall behind and will NOT be able to graduate in the standard 4 years.

Q: I am unable to register for Junior Lab (CHEN 3130). Why is this so?
A: For the Spring CHEN 3130, you must register with your advisor.

Q: Chemical Engineering Materials (CHEN 4440) is not being offered this semester but is a required course for the CHEN degree. Are there any alternative courses I can take?
A: Yes, Polymer Engineering (CHEN 4460) is a suitable alternative to CHEN 4440 and these courses are interchangeable. Note that Biomaterials (CHEN 4805) is required of all CBEN students for the CBEN

degree, but Biomaterials cannot be used in place of either CHEN 4440 or CHEN 4460 for the CHEN degree.

Q: Since the senior thesis sequence is 4 credit hours total, can the final 2 credit hours count toward the 6 required hours of CHEN 3000+ technical electives?
A: Yes.

Q: I heard it is pretty easy for Chemical Engineering students to get a Chemistry or a Biochemistry minor. What additional courses do I need to take to get one of these minors?
A: Yes, for a minor in Chemistry, the only other courses required in addition to the basic CHEN/CBEN courses are CHEM 1133/1134 (5) General Chemistry 2 and Lab and either CHEM 4011 Modern Inorganic or CHEM 4171 Instrumental Analysis.

For a minor in Biochemistry, the only other courses are CHEM 1133/1134 General Chemistry 2 and Lab and BOTH of CHEM 4711 (3) General Biochemistry 1 and CHEM 4731 (3) General Biochemistry 2 or just CHEM 4611 (3) Survey of Biochemistry.

Q: I have taken CHEM 1113/1114 General Chemistry 1 and Lab. Is this equivalent to CHEN 1211 and CHEM 1221.
A: No. The one-semester courses CHEN 1211 and CHEM 1221 cover important material (but not all material) from CHEM 1113/1114 and CHEM 1133/1134. If you are an A&S student transferring into CHEN or CBEN and you have only taken CHEM 1113/1114, you MUST take either CHEN 1211 or continue with CHEM 1133/1134 (preferred).

Q: Does CHEM 1133/1134 count as a technical elective?
A: If you took CHEM 1133/1134 (or the old 1131/1141 combination) before 2007 then it will count as a technical elective. Otherwise, it will not count as a technical elective.

Q: Does CSCI 1300 count in lieu of GEEN 1300?
A: No. You must take GEEN 1300 for the CHEN or CBEN degree.

Q: Do GEEN 1510 and GEEN 1520 count for technical credit? For H&SS credit? Free elective credit?
A: GEEN 1510-2 and GEEN 1520-1 do not count for technical elective credit. However, you may apply 1 credit of GEEN 1510 as H&SS credit and the other as free elective credit. The one credit from GEEN 1520 may be applied as free elective credit but not as H&SS credit.

Q: I took CHEN 2810 (Biology for Engineers) before I switched to the Pre-Med option (either CHEN or CBEN). MCDB 1150 and MCDB 1151 (lab) are requirements for the Pre-Med option. Will CHEN 2810 count in place of MCDB 1150/1151?
A: Yes and no. CHEN 2810 is a suitable replacement for MCDB 1150. However, medical schools like that students have lab classes, so you will need to take MCDB 1151 at some point. Since MCDB 1151 is not a requirement for other courses in the CHEN/CBEN curriculum, there is no hurry on taking this lab, but MCDB 1151 must be taken prior to applying to medical schools. NOTE: If you are double majoring in MCDB, you must take MCDB 1151 prior to taking MCDB 2150.

Q: I took MCDB 1150/1151 instead of CHEN 2810. Does this course count in lieu of CBEN 2810?
A: Yes. The additional credit hour earned for MCDB 1151 can be applied toward technical elective credit.

Q: I took WRTG 3030. Can I take HUEN 3100 in addition to WRTG 3030 for upper level H&SS credit. Or, is this not allowed since both WRTG 3030 and HUEN 3100 count for the general engineering writing requirements?
A: Yes, you may take both WRTG 3030 and HUEN 3100. HUEN 3100 will count as an upper level H&SS credit.

Q: I received a D in O Chem 2 (CHEM 3331). This is a required course for graduation, yet I did not pass with a grade of C- or better. Does this mean I need to re-take CHEM 3331?
A: You must earn a C- grade or better in: 1) any course that is needed as a prereq for any required course for chemical/biological engineering (e.g., since CHEM 3311 is a prereq for CHEM 4611 then you need to earn a grade of C- or better; since APPM 2360 is a prereq for CHEN 3010 you need to earn a grade of C- or better); 2) any CHEN course required for graduation. CHEN 2120 requires a grade of C or better.

Q: Let's say I took CHEN 4440 (Materials) and passed with a C- or above. Then I took CHEN 4460 (Polymer Engineering) but did not intend on using this class to take the place of the material requirement (because I had already taken and passed CHEN 4440). I received a D in CHEN 4460. Does this still count towards my technical elective credit or since it is a CHEN class does it not count since all CHEN courses must be passed with a C- or above?
A: If you are using CHEN 4460 as one of your technical electives within the department (i.e., as one of the CHEN 3000+ requirements) then your D grade in CHEN 4460 will not count towards technical elective credit. However, you may apply this course as credit towards a non-CHEN 3000+ technical elective.

Q: My MAPS evaluation states that I have 2.5 credits for one of my MAPS requirements and I need 3.0. How do I satisfy the remaining 0.5 MAPS credits? Do I need to take a full class to get the 0.5 credits?
A: 1 MAPS unit = 1 year at the high school level, or 1 semester's worth at the college level. Since CU does not have half-semester courses, yes, you need to take a full social science course (like economics, sociology, US or world history, human geography).

Q: What is the maximum number of credit hours I can take per semester?
A: 18 credit hours as an engineering student. See the College Policy here: http://registrar.colorado.edu/students/registration/registration_packet/credit_hour_limits.html

### Transfer Credit (AP/IB/other)

General information regarding transfer credit in the College of Engineering can be found here.
Information on transferring to or from the College of Engineering can be found here.

Q: I have AP and IB credit from high school. Do these courses count for college credit in the College of Engineering?
A: Depending upon what your scores are and which subject, you may get college credit for various engineering and non-engineering related courses. For example, a score of 4 or 5 on the AP Calculus BC examination can be used as credit for APPM 1350 and APPM 1360, a total of 8 credit hours. Please consult your advisor for more information.

Q: I have transfer credit and would like to apply this credit towards a degree in Chemical Engineering (or Chemical and Biological Engineering). Will this credit count towards my major?

A: Transfer credit may or may not count. You will have to contact the Office of Admissions and they will determine which courses will likely transfer. Just because credits are accepted by admissions does not mean that they will count towards your degree requirements.

Q: I have transfer credit from over 10 years ago. Will this credit transfer or will I need to re-take the courses?

A: In general, credit for courses taken over 10 years ago will not transfer, particularly for courses in calculus, physics, and chemistry. However, the transfer credit evaluators in each department can decide if they will accept other courses. For more information, please see the official rule here.

Q: I am a student at CU Denver and would like to transfer to CU Chemical and Biological Engineering. What course should I take at CU Denver that will be equivalent to CHEN1211/CHEM 1221?

A: You may either take the two-semester sequence of CHEM 2031/2038 (4 cr) AND CHEM 2061/2068 or you can take CHEM 1130 (Chemistry for Engineers) AND CHEN 1221 (lab) when you arrive at CU Boulder.

Q: I've been placed on a wait list. What does this mean and will I get into the course that I'm waitlisted for?

A: Please see the following link for information related to wait lists: http://registrar.colorado.edu/students/registration/registration_packet/wait_lists.html

In general it is a good idea to stay on the wait list. Depending upon how many students are on the wait list, the class may or may not increase in size as the start of the semester approaches.

Q: I have completed several courses at a college or university other than CU. I am interested in transferring to CU Boulder and studying Chemical and Biological Engineering. Will these credits transfer and, if so, how will I know what courses they are equivalent to?

A: Yes, it is likely that your courses will transfer, depending upon the nature of and your grade in the course. Initially, you should contact the Office of Admissions if you are thinking of transferring. They can do a basic run-down/comparison on your courses to see what CU Boulder courses they are equivalent to. You can check this website to get a general idea about what courses may transfer: www.transfer.org.
If you have completed specialized courses in chemical and biological engineering, it is likely that the Office of Admissions will be unable to evaluate these courses. In these cases, the Department of Chemical and Biological Engineering has two Transfer Credit Evaluators to evaluate specific engineering courses: Dr. David Clough (David.Clough@Colorado.EDU).

Undergraduate students in the Department of Chemical and Biological Engineering are HIGHLY encouraged to complete an Independent Study project at some point in their time as a student. Independent Study can count for up to 6 hours of technical elective credit (3 of which can apply to upper level technical elective credit). If you are interested in completing an independent study project, please contact professors individually to see what projects are available. Many of our undergraduate students partake in these types of projects.

Q: How many credits of independent study can count as technical elective credit toward the B.S. degree in CHEN or CBEN?

A: You may apply 6 credits total of independent study towards your technical elective credit, 3 of which can be upper level (CHEN 3000+) credit.

Q: How do I change my major within the College of Engineering and Applied Science?

A: In order to change your major, you must sign a Change of Major form found here. Have this form signed by the old major department and the new major department. If you are changing your major from Open Option to another major, you will need to have the Open Option Advisor sign the form as the old major.

Q: I am currently an Arts and Sciences major and I am interested in changing majors to Chemical and Biological Engineering. What do I need to do?

A: Because the academic standards may be different in different colleges of the university, you must apply to the new college through an Intra-University Transfer (IUT). More information can be found here and here.

# Standard Chemical Engineering Curriculum

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 | CHEN 2810 Biology for Engineers (alt MCDB 1150 or EBIO 1210 and 1220) | 3 |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 15 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Linear Algebra & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3311 O Chem 1 | 4 | CHEM 3331 O Chem 2 | 4 |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1120 Physics 2 | 4 | CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| PHYS 1140 Physics 2 Lab | 1 | [1]H&SS | 3 |
| Total Credits | 17 | Total Credits | 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEN 4330 Kinetics | 3 |
| Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 | [2]Advanced Chemistry Elective | 3 |
| Free Elective | 4 | [3]Technical Elective | 3 |
| | | [1]H&SS | 3 |
| Total Credits | 16 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4440 Materials | 3 |
| CHEN 4130 ChE Lab 2 | 2 | CHEN 4530 Design Project | 2 |
| CHEN 4520 Design | 3 | CHEN 4570 Process Control | 4 |
| [3]Technical Elective | 3 | [3]Technical Elective | 3 |
| [3]Technical Elective | 3 | [3]Technical Elective | 3 |
| [1]H&SS | 3 | | |
| Total Credits | 15 | Total Credits | 15 |

[1] Six credit hours must be 3000+

[2] Approved Advanced Chemistry Electives

- CHEM 4011 (3) Inorganic Chemistry
- CHEM 4171 (3) Instrument Analysis
- CHEM 4531 (3) Physical Chemistry 2
- CHEM 4611 (3) Survey of Biochemistry
- CHEM 4711 (3) General Biochemistry 1
- CHEM 4731 (3) General Biochemistry 2
- CHEM 4761 (3) Biochemistry Lab
- CHEM 5321 (3) Advanced Physical Chemistry

[3] Six credit hours must be CHEN 3000+; below are possible options:

- CHEN 3838 (3) Special Topics
- CHEN 4390 (3) Chemical Reactor Engineering
- CHEN 4450 (3) Polymer Chemistry
- CHEN 4460 (3) Polymer Engineering
- CHEN 4520 (3) Chemical Process Synthesis
- CHEN 4580 (3) Numerical Methods for Process Simulation
- CHEN 4630 (1) Intellectual Property Law and Engineering
- CHEN 4650 (3) Particle Technology
- CHEN 4670 (3) Environmental Separations
- CHEN 4680 (3) Environmental Process Engineering
- CHEN 4800 (3) Bioprocess Engineering
- CHEN 4801 (3) Pharmaceutical Biotechnology
- CHEN 4803 (3) Metabolic Engineering
- CHEN 4820 (3) Biomedical Separations
- CHEN 4830 (3) Biokinetics
- CHEN 4836 (3) Nanomaterials
- CHEN 3000+ (1-4) Independent Study

# Bioengineering Curriculum

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab | 1 | CHEN 2810 Biology for Engineers | 3 |
| (alt CHEM 1113/1114 and CHEM 1133/1134) | | (alt MCDB 1150 or EBIO 1210 and 1220) | |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 15 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Lin Alge & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids | 3 |
| CHEM 3311 O Chem 1 | 4 | (alt MCEN 3021 Fluids) | |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3331 O Chem 2 | 4 |
| PHYS 1120 Physics 2 | 4 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1140 Physics 2 Lab | 1 | CHEN 4521 P Chem for Engineers | 3 |
| | | (alt CHEM 4511 and CHEM 4531) | |
| | | [1]H&SS | 3 |
| Total Credits | 17 | Total Credits | 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| (alt MCEN 3022 Heat Transfer) | | CHEN 4330 Kinetics | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEM 4711 Biochemistry 1 | 3 |
| Writing Requirement | 3 | [2,3]Bio Elective 1 | 3 |
| (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | | [1]H&SS | 3 |
| Free Elective | 4 | | |
| Total Credits | 16 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4440 Materials | 3 |
| CHEN 4130 ChE Lab 2 | 2 | CHEN 4530 Design Project | 2 |
| CHEN 4520 Design | 3 | CHEN 4570 Process Control | 4 |
| [2]Technical Elective | 3 | [2,3]Bio Elective 3 | 3 |
| [2,3]Bio Elective 2 | 3 | [1]H&SS | 3 |
| [4]Bioscience Elective | 3 | | |
| Total Credits | 15 | Total Credits | 15 |

[1] Six credit hours must be 3000+

[2] Six credit hours must be CHEN 3000+

[3] Two Bio Electives must come from this list:

- CHEN 4801 (3) Pharmaceutical Biotechnology
- CHEN 4803 (3) Metabolic Engineering
- CHEN 4805 (3) Biomaterials
- CHEN 4820 (3) Bioseparations
- CHEN 4838 (3) Tissue Engineering
- CHEN 3000+ (1-3) Independent Study

[4] The Bio Science Elective must come from this list:

- CHEM 4621 (3) Genome Databases: Mining and Mgmt.
- CHEM 4731 (3) Biochemistry 1
- CHEM 4791 (3) Bioorganic Chemistry in Biotechnology
- CHEM 5341 (3) Chemical Biology and Drug Design
- MCDB 2150 (3) Genetics
- MCDB 4615 (3) Biology of Stem Cells
- EBIO 2070 (4) Genetics
- EBIO 3400 (4) Microbiology
- IPHY 3410 (3) Human Anatomy
- IPHY 3430 (3) Human Physiology
- IPHY 4200 (3) Physiological Genetics and Genomics

# Energy Option Curriculum – Biofuels Focus

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 | CHEN 2810 Biology for Engineers (alt MCDB 1150 or EBIO 1210 and 1220) | 3 |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 15 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Lin Alg & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3311 O Chem 1 | 4 | CHEM 3331 O Chem 2 | 4 |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1120 Physics 2 | 4 | CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| PHYS 1140 Physics 2 Lab | 1 | [2]ENVS 3070 Energy & Environment (alt PHYS 3070 Energy & Environment) | 3 |
| Total Credits | 17 | Total Credits | 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEN 4330 Kinetics | 3 |
| [3]MCDB 2150 Genetics | 3 | CHEN 4440 Materials | 3 |
| [3]MCDB 2151 Genetics Lab | 1 | [3,4]Energy Elective | 3 |
| Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 | [1]H&SS | 3 |
| Total Credits | 16 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4530 Design Project | 2 |
| CHEN 4130 ChE Lab 2 | 2 | CHEN 4570 Process Control | 4 |
| CHEN 4520 Design | 3 | CHEN 4838 Energy Fundamentals | 3 |
| CHEM 4611 General Biochemistry 1 | 3 | [3,4]Energy Elective | 3 |
| [3,4]Energy Elective | 3 | [1]H&SS | 3 |
| [1]H&SS | 3 | | |
| Total Credits | 15 | Total Credits | 15 |

[1] Six credit hours must be 3000+
[2] Six credit hours must be CHEN 3000+
[3] Counts as a technical elective
[4] Suggested Energy Electives:
CHEN 4803 (3) Metabolic Engineering
CHEN 5360 (3) Catalysis and Kinetics
CHEN 3000+ (1-3) Independent Study
MCEN 4162 (3) Energy Conversion

# Energy Option Curriculum – Fossil Fuels and Petroleum Focus

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 | CHEN 2810 Biology for Engineers (alt MCDB 1150 or EBIO 1210 and 1220) | 3 |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 | [1]H&SS | 3 |
| | Total Credits 15 | | Total Credits 15 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Lin Alg & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3311 O Chem 1 | 4 | CHEM 3331 O Chem 2 | 4 |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1120 Physics 2 | 4 | CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| PHYS 1140 Physics 2 Lab | 1 | [3]GEOL 1010 Intro to Geology | 3 |
| | Total Credits 17 | | Total Credits 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEN 4330 Kinetics | 3 |
| Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 | CHEN 4440 Materials | 3 |
| [2,3,4]Energy Elective | 4 | [2,3,4]Energy Elective | 3 |
| | | [1]H&SS | 3 |
| | Total Credits 16 | | Total Credits 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4530 Design Project | 2 |
| CHEN 4130 ChE Lab 2 | 2 | CHEN 4570 Process Control | 4 |
| CHEN 4520 Design | 3 | CHEN 4838 Energy Fundamentals | 3 |
| CHEM 4531 P Chem 2 | 3 | [2,3,4]Energy Elective | 3 |
| ENVS 3070 Energy and the Environment (alt PHYS 3070 Energy and the Environment) | 3 | [1]H&SS | 3 |
| [1]H&SS | 3 | | |
| | Total Credits 15 | | Total Credits 15 |

[1] Six credit hours must be 3000+
[2] One must be CHEN 3000+ Independent Study; six credits must be CHEN 3000+
[3] Counts as a technical elective
[4] Suggested Energy Electives:
- GEOL 3010 (3) Intro to Mineralogy
- GEOL 3020 (3) Intro to Petrology
- GEOL 3320 (3) Intro to Geochemistry
- GEOL 3540 (3) Intro to Hydrocarbon Geology
- CVEN 3698 (3) Engineering Geology
- MCEN 4125(3) Intro to Combustion
- MCEN 4162 (3) Energy Conversion

# Energy Option Curriculum – Photovoltaic Focus

| 1st Year Fall Semester | |
|---|---|
| APPM 1350 Calc 1 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 |
| CHEM 1221 Gen Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 |
| GEEN 1300 Computing | 3 |
| [1]H&SS | 3 |
| Total Credits | 15 |

| 1st Year Spring Semester | |
|---|---|
| APPM 1360 Calc 2 | 4 |
| CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEN 2810 Biology for Engineers (alt MCDB 1150 or EBIO 1210 and 1220) | 3 |
| PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 |
| Total Credits | 15 |

| Sophomore Fall Semester | |
|---|---|
| APPM 2350 Calc 3 | 4 |
| CHEN 2120 Materials & Energy Balance | 3 |
| CHEM 3311 O Chem 1 | 4 |
| CHEM 3321 O Chem 1 Lab | 1 |
| PHYS 1120 Physics 2 | 4 |
| PHYS 1140 Experimental Physics 2 Lab | 1 |
| Total Credits | 17 |

| Sophomore Spring Semester | |
|---|---|
| APPM 2360 Lin Alge & Diff Eq | 4 |
| CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3331 O Chem 2 | 4 |
| CHEM 3341 O Chem 2 Lab | 1 |
| CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| [3]ECEN 3030 Circuits (alt MCEN 3017 Circuits) | 3 |
| Total Credits | 18 |

| Fall Semester | |
|---|---|
| CHEN 3010 Applied Data Analysis | 3 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 |
| CHEN 3320 Thermodynamics | 3 |
| [3]PHYS 2130 Physics 3 | 3 |
| [3]PHYS 2150 Experimental Physics | 1 |
| Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 |
| Total Credits | 16 |

| Spring Semester | |
|---|---|
| CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 4330 Kinetics | 3 |
| CHEN 4440 Materials | 3 |
| [2,3,4]Energy Elective | 3 |
| [1]H&SS | 3 |
| Total Credits | 17 |

| Senior Fall Semester | |
|---|---|
| CHEN 4090 Senior Seminar | 1 |
| CHEN 4130 ChE Lab 2 | 2 |
| CHEN 4520 Design | 3 |
| CHEM 4011 Inorganic Chemistry | 3 |
| ENVS 3070 Energy and the Environment (alt PHYS 3070 Energy and the Environment) | 3 |
| [1]H&SS | 3 |
| Total Credits | 15 |

| Senior Spring Semester | |
|---|---|
| CHEN 4530 Design Project | 2 |
| CHEN 4570 Process Control | 4 |
| [F F]CHEN 4838 Energy Fundamentals | 3 |
| [2,3,4]Energy Elective | 3 |
| [1]H&SS | 3 |
| Total Credits | 15 |

[1] Six credit hours must be 3000+
[2] Six credit hours must be CHEN 3000+
[3] Counts as a technical elective
[4] Suggested Energy Electives:
ECEN 3320 (3) Semiconductor Devices
ECEN 4345 (3) Intro to Solid State
MCEN 4162 (3) Energy Conversion
CHEN 3000+ (1-3) Independent Study

# Environmental Curriculum

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 | CHEN 2810 Biology for Engineers (alt MCDB 1150 or EBIO 1210 and 1220) | 3 |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 15 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Lin Alg & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3311 O Chem 1 | 4 | CHEM 3331 O Chem 2 | 4 |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1120 Physics 2 | 4 | CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| PHYS 1140 Physics 2 Lab | 1 | [3]CVEN 3414 Fundamentals of Environ Engineering | 3 |
| Total Credits | 17 | Total Credits | 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEN 4330 Kinetics | 3 |
| Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 | Chem Elective | 3 |
| [6]Environmental Science Elective | 3 | [2,4,5]Environmental Engineering Elective | 3 |
| | | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4440 Materials | 3 |
| CHEN 4130 ChE Lab 2 | 2 | [3]CHEN 4530 Design Project | 2 |
| CHEN 4520 Design | 3 | CHEN 4570 Process Control | 4 |
| [2,4,5]Environmental Engineering Elective | 3 | [2,4,5]Environmental Engineering Elective | 3 |
| Free Elective | 4 | [1]H&SS | 3 |
| [1]H&SS | 3 | | |
| Total Credits | 16 | Total Credits | 15 |

[1] Six credit hours must be 3000+
[2] Six credit hours must be CHEN 3000+
[3] Counts as a technical elective

[4] At least one Environmental Engineering Elective must come from this list:

- CHEN 4650 (3) Particle Technology
- CHEN 4670 (3) Environmental Separations
- CHEN 4838 (3) Energy Fundamentals
- CHEN 3000+ (1-3) Independent Study

[5] Additional courses that count as Environmental Engineering Electives include:

- CVEN 3424 (3) Water and Wastewater Treatment
- CVEN 3454 (3) Water Chemistry
- CVEN 4424 (3) Aquatic Org Chemistry
- CVEN 4434 (3) Environmental Engineering Design
- CVEN 4474 (3) Hazard & Industrial Waste Management
- CVEN 4484 (3) Environmental Microbiology
- MCEN 4131 (3) Air Pollution Control
- CHEN 4670 (3) Environmental Separations
- CHEN 4650 (3) Particle Technology
- CHEN 4838 (3) Energy Fundamentals

[6] Environmental Science Electives include:

- GEOL 1001 (4) Environmental Systems 1
- GEOL 1011 (4) Environmental Systems 2
- GEOL 1010 (3) Intro to Geology 1
- GEOL 1060 (3) Global Change 1

# Materials Curriculum

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 | CHEN 2810 Biology for Engineers (alt MCDB 1150 or EBIO 1210 and 1220) | 3 |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 15 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Lin Alg & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3311 O Chem 1 | 4 | CHEM 3331 O Chem 2 | 4 |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1120 Physics 2 | 4 | CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| PHYS 1140 Experimental Physics Lab | 1 | [1]H&SS | 3 |
| Total Credits | 17 | Total Credits | 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEN 4330 Kinetics | 3 |
| Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 | CHEN 4440 Materials | 3 |
| [3]Materials Elective 1 | 3 | [2]Technical Elective | 3 |
| | | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4530 Design Project | 2 |
| CHEN 4130 ChE Lab 2 | 2 | CHEN 4570 Process Control | 4 |
| CHEN 4520 Design | 3 | [3]Materials Elective 3 | 3 |
| CHEM 4011 Inorganic Chemistry | 3 | Free Elective | 4 |
| [2]Technical Elective | 3 | [1]H&SS | 3 |
| [3]Materials Elective 2 | 3 | | |
| Total Credits | 15 | Total Credit | 16 |

[1] Six credit hours must be 3000+
[2] Six credit hours must be CHEN 3000+
[3] Suggested Materials Electives

| | |
|---|---|
| CHEN 4450 (3) Polymer Chemistry | ASEN 4012 (3) Aerospace Materials |
| CHEN 4460 (3) Polymer Engineering | CHEN 4836 (3) Nanomaterials |
| CHEN 4650 (3) Particle Technology | *MCEN 2024 (3) Materials Science |

*NOTE: MCEN 2024 Materials Science cannot be taken if CHEN 4440 is also taken.

# Pre Med Chemical Engineering Curriculum

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 General Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 General Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 | CHEM 1131 General Chemistry 2 | 5 |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| H&SS | 3 | H&SS | 3 |
| Total Credits | 15 | Total Credits | 17 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Lin Alg & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3311 O Chem 1 | 4 | CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| CHEM 3321 O Chem 1 Lab | 1 | PHYS 1120 Physics 2 | 4 |
| MCDB 1150 Intro to Cellular & Molecular Bio | 3 | [4]MCDB 2150 Principals of Genetics | 3 |
| [4]MCDB 1151 Intro to Cellular & Molecular Bio Lab (alt EBIO 1210 and 1220) | 1 | [4]MCDB 2151 Principals of Genetics Lab (alt EBIO 1230 and 1240) | 1 |
| Total Credits | 16 | Total Credits | 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEN 4330 Kinetics | 3 |
| CHEM 3331 O Chem 2 | 4 | CHEM 4611 Survey of Biochemistry (alt CHEM 4711 and 4731) | 3 |
| CHEM 3341 O Chem 2 Lab | 1 | Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 |
| PHYS 1140 Physics 2 Lab | 1 | [2]H&SS | 3 |
| Total Credits | 15 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4440 Materials | 3 |
| CHEN 4130 ChE Lab 2 | 2 | CHEN 4530 Design Project | 2 |
| CHEN 4520 Design | 3 | CHEN 4570 Process Control | 4 |
| [3]Technical Elective | 3 | [3]Technical Elective | 3 |
| [3]Technical Elective | 3 | [2]H&SS | 3 |
| [2]H&SS | 3 | | |
| Total Credits | 15 | Total Credits | 15 |

*NOTE: By spring of your sophomore year, you should contact Janet De Grazia (degrazia@colorado.edu or 303.735.4763) for guidance on preparation for medical school.

[1] ENGL 1500 is a common option; there are other options.
[2] Six credit hours must be 3000+
[3] Six credit hours must be CHEN 3000+
[4] Counts as a technical elective

## The Cooperative Education Program

The Cooperative Education Program (Co-Op Program) is a professional development program that allows undergraduate students to alternate professional work experiences with classroom coursework. Students typically complete a total of one year of work off-campus at their co-op company by either working continuously for a year or alternating work sessions with academic terms. Co-ops are typically completed during the sophomore or junior years.

Co-op experiences are paid and result in academic credit, although this credit does not apply towards the student's degree. Co-op students receive an official entry on their transcript for each co-op experience. At least three co-op assignments must be completed to earn a Certificate of Cooperative Education upon graduation.

Students may participate in the Co-op Program after successfully passing CHEN 2120, Material and Energy Balances. Students must have a minimum 2.75/4.00 GPA. A student on co-op assignment registers for CHEN 3930 (a 6 credit hour course) and pays a co-op fee for each work session through the College of Continuing Education.

Please see the **departmental co-op website** or contact the **ChBE Co-op Coordinator** for more information.

# Chemical and Biological Engineering Curriculum

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab (alt CHEM 1113/1114 and CHEM 1133/1134) | 1 | CHEN 2810 Biology for Engineers (alt MCDB 1150 or EBIO 1210 and 1220) | 3 |
| GEEN 1300 Computing | 3 | PHYS 1110 Physics 1 | 4 |
| [1]H&SS | 3 | [1]H&SS | 3 |
| Total Credits | 15 | Total Credits | 15 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Linear Algebra & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids (alt MCEN 3021 Fluids) | 3 |
| CHEM 3311 O Chem 1 | 4 | CHEM 3331 O Chem 2 | 4 |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1120 Physics 2 | 4 | CHEN 4521 P Chem for Engineers (alt CHEM 4511 and CHEM 4531) | 3 |
| PHYS 1140 Experimental Lab | 1 | [1]H&SS | 3 |
| Total Credits | 17 | Total Credits | 18 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer (alt MCEN 3022 Heat Transfer) | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEN 4830 Biokinetics | 3 |
| Writing Requirement (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | 3 | CHEM 4611 Survey of Biochemistry (alt CHEM 4711 and 4731) | 3 |
| Free Elective | 4 | CHEN 4805 Biomaterials | 3 |
| | | [1]H&SS | 3 |
| Total Credits | 16 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4530 Design Project | 2 |
| CHEN 4810 CBEN Lab 2 | 2 | CHEN 4570 Process Control | 4 |
| CHEN 4520 Design | 3 | Focus Technical Elective | 3 |
| CHEN 4820 Bioseparations | 3 | [3]Technical Elective | 3 |
| [3]Technical Elective | 3 | H&SS | 3 |
| [3]Technical Elective | 3 | | |
| Total Credits | 15 | Total Credits | 15 |

[1] Six credit hours must be 3000+

Focus Tech Elective must be one of the following:
CHEN 4801 (3) Pharmaceutical Biotechnology
CHEN 4803 (3) Metabolic Engineering
CHEN 4838 (3) Tissue Engineering / Biomedical Devices

[3] Recommended Technical Electives:

| Biofuels Focus | Tissue Engineering Focus | Pharmaceutical Biotechnology Focus |
|---|---|---|
| MCDB 2150 (3) Genetics | MCDB 2150 (3) Genetics | MCDB 2150 (3) Genetics |
| CHEN 4838 Energy Fundamentals | CHEM 4731 (3) Biochemistry 2 | CHEM 4731 (3) Biochemistry 2 |
| CHEM 4621 (3) Genome Database | IPHY 3410 (3) Human Anatomy | IPHY 3410 (3) Human Anatomy |
| MCEN 4162 (3) Energy Conservation | IPHY 3430 (3) Human Physiology | CHEM 4791 (3) Bioorg Chemistry |
| IPHY 4200 (3) Physio Genetics & Genomics | MCDB 4615 (3) Biological Stem Cells | CHEM 5341 (3) Chem Biology & Drug Design |
| CHEN 3000+ (1-3) Independent Study | CHEN 3000+ (1-3) Independent Study | CHEN 3000+ (1-3) Independent Study |

# Pre Med Chemical and Biological Engineering Curriculum

| 1st Year Fall Semester | | 1st Year Spring Semester | |
|---|---|---|---|
| APPM 1350 Calc 1 | 4 | APPM 1360 Calc 2 | 4 |
| CHEN 1211 Gen Chemistry for Engineers | 4 | CHEN 1300 Intro to Chemical Engineering | 1 |
| CHEM 1221 Gen Chem for Engineers Lab | 1 | CHEM 1133/1134 Gen Chem 2 & Lab | 5 |
| (alt CHEM 1113/1114 and CHEM 1133/1134) | | PHYS 1110 Physics 1 | 4 |
| GEEN 1300 Computing | 3 | [1,2]H&SS | 3 |
| MCDB 1150/1151 Intro to Cellular Biology & Lab | 4 | | |
| Total Credits | 16 | Total Credits | 17 |

| Sophomore Fall Semester | | Sophomore Spring Semester | |
|---|---|---|---|
| APPM 2350 Calc 3 | 4 | APPM 2360 Linear Algebra & Diff Eq | 4 |
| CHEN 2120 Materials & Energy Balance | 3 | CHEN 3200 Fluids | 3 |
| CHEM 3311 O Chem 1 | 4 | (alt MCEN 3021 Fluids) | |
| CHEM 3321 O Chem 1 Lab | 1 | CHEM 3331 O Chem 2 | 4 |
| PHYS 1120 Physics 2 | 4 | CHEM 3341 O Chem 2 Lab | 1 |
| PHYS 1140 Experimental Lab | 1 | CHEN 4521 P Chem for Engineers | 3 |
| | | (alt CHEM 4511 and CHEM 4531) | |
| Total Credits | 17 | Total Credits | 15 |

| Junior Fall Semester | | Junior Spring Semester | |
|---|---|---|---|
| CHEN 3010 Applied Data Analysis | 3 | CHEN 3130 ChE Jr Lab | 2 |
| CHEN 3210 Heat Transfer | 3 | CHEN 3220 Separations & Mass Transfer | 3 |
| (alt MCEN 3022 Heat Transfer) | | CHEN 4830 Biokinetics | 3 |
| CHEN 3320 Thermodynamics | 3 | CHEM 4611 Survey of Biochemistry | 3 |
| MCDB 2150/2151 Genetics and Lab | 4 | (alt CHEM 4711 and 4731) | |
| Writing Requirement | 3 | CHEN 4805 Biomaterials | 3 |
| (alt HUEN 1010, GEEN 3000, WRTG 3030, WRTG 3035, or HUEN 3100) | | [1,2]H&SS | 3 |
| Total Credits | 16 | Total Credits | 17 |

| Senior Fall Semester | | Senior Spring Semester | |
|---|---|---|---|
| CHEN 4090 Senior Seminar | 1 | CHEN 4530 Design Project | 2 |
| CHEN 4810 CBEN Lab 2 | 2 | CHEN 4570 Process Control | 4 |
| CHEN 4520 Design | 3 | Focus Technical Elective | 3 |
| CHEN 4820 Bioseparations | 3 | [1,2]H&SS | 3 |
| [3]Technical Elective | 3 | [1,2]H&SS | 3 |
| [1,2]H&SS | 3 | | |
| Total Credits | 15 | Total Credits | 15 |

*NOTE: By spring of your sophomore year, you should contact Janet De Grazia (degrazia@colorado.edu or 303.735.4763) for guidance on preparation for medical school.

[1] Six credit hours must be 3000+
[2] One H&SS must be a lit elective. ENGL 1500 is a common option; there are other options.
[3] Six credit hours must be CHEN 3000+
[4] Counts as a technical elective

Focus Tech Elective must be one of the following:
CHEN 4801 (3) Pharmaceutical Biotechnology
CHEN 4803 (3) Metabolic Engineering
CHEN 4838 (3) Tissue Engineering / Biomedical Devices

# Standard Chemical Engineering Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | Adv Chem Elective-3 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics**<br>PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| **4 cr Free Electives** | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)**<br>CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | Tech Elecvtive-3 | Tech Elective-3 |
| | **18 H&SS (6 cr or more must be 3000+)**<br>1-<br>2-<br>3- | 4-<br>5-<br>Writing Requirement | Tech Elective-3 | Tech Elective-3<br>CHEN 3000+ | Tech Elective-3<br>CHEN 3000+ |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

**Advanced Chemistry Electives:**

CHEM 4011 (3) Modern Inorganic
CHEM 4171 (3) Instrumental Analysis
CHEM 4531 (3) P Chem 2
CHEM 4611 (3) Survey of Biochem
CHEM 4711 (3) Biochem 1
CHEM 4731 (3) Biochem 2
CHEM 4761 (4) Biochem Lab
CHEM 5321 (3) Advanced P Chem

# Bioengineering Option Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4611-3<br>Survey of Biochem<br>(alt CHEM 4711/4731)<br>P: CHEM 3311 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics**<br>PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| **4 cr Free Electives** | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)**<br>CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | Tech Elecvtive-3 | *Bioscie Elective-3 |
| | **18 H&SS (6 cr or more must be 3000+)**<br>1-<br>2-<br>3- | 4-<br>5-<br>Writing Requirement | Bio Elective-3 | Bio Elective-3<br>CHEN 3000+ | Bio Elective-3<br>CHEN 3000+ |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

**2 Bio Electives must come from this list:**

CHEN 4801 (3) Pharm Bio
CHEN 4803 (3) Metabolic Eng
CHEN 4805 (3) Biomaterials
CHEN 4820 (3) Bioseparations
CHEN 4838 (3) Tissue Engin
CHEN 4840 (3) Ind Study

***Bioscience Electives on curriculum sheet**

# Energy Option Biofuels Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4611-3<br>Survey of Biochem<br>(alt CHEM 4711/4731)<br>P: CHEM 3311 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics**<br>PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| **4 cr Adtl Electives**<br>ENVS/PHYS 3070-3<br>Energy & Envir<br><br>MCDB 2151-1<br>Genetics Lab | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)**<br>CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | CHEN 4838-3<br>Energy Fundamentals | MCDB 2150-3<br>Genetics |
| | **18 H&SS (6 cr or more must be 3000+)**<br>1-<br><br>2-<br><br>3- | 4-<br><br>5-<br><br>Writing Requirement | Energy Elective-3 | Energy Elective-3 | Energy Elective-3<br>CHEN 3000+ |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

**Suggested Energy Electives:**
MCEN 4162 (3) Energy Conversion
CHEN 4803 (3) Metabolic Engineering
CHEN 5360 (3) Catalysis and Kinetics

CHEN 3000+ Independent Study



Dec 2013 DR

# Energy Option Fossil Fuels and Petroleum Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4531-3<br>P Chem 2<br>P: PHYS 1120<br>P: CHEN 4521<br>(CHEM 4511) | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics**<br>PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| **4 cr Free Electives**<br>ENVS/PHYS 3070-3<br>Energy & Envir<br><br>and 1 additional credit | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)**<br>CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | GEOL 1010-3<br>Intro to Geology | CHEN 4838-3<br>Energy Fundamentals |
| | **18 H&SS (6 cr or more must be 3000+)**<br>1-<br><br>2-<br><br>3- | 4-<br><br>5-<br><br>Writing Requirement | CHEN 3840/4840-3<br>Independent Study | Energy Elective-3 | Energy Elective-3 |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

**Energy Electives:**

GEOL 3010 (3) Intro to Mineralogy
GEOL 3020 (3) Intro to Petrology
GEOL 3320 (3) Intro to Geochem
CVEN 3698 (3) Engineering Geology
MCEN 4152 (3) Intro to Combustion
MCEN 4162 (3) Energy Conversion

# Energy Option Photovoltaics Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4011-3<br>Modern Inorganic<br>P: CHEN 4521 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics**<br>PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| **4 cr Free Electives** | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)** | | |
| ENVS/PHYS 3070-3<br>Energy & Envir<br><br>PHYS 2150-1<br>Physics 3 Lab | | | CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | ECEN 3030-3<br>or<br>MCEN 3017-3<br>Circuits | CHEN 4838-3<br>Energy Fundamentals |
| | **18 H&SS (6 cr or more must be 3000+)** | | PHYS 2130-3<br>Physics 3 | CHEN 3840/4840-3<br>Independent Study | Energy Elective-3 |
| | 1-<br><br>2-<br><br>3- | 4-<br><br>5-<br><br>Writing Requirement | | | |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

**Energy Electives:**
ECEN 3320 (3) Seminconductor Devices
ECEN 4345 (3) Intro to Solid State
MCEN 4162 (3) Energy Conversion

# Environmental Option Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | Adv Chem Elective-3 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics**<br>PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| **4 cr Free Electives** | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)** | | |
| | | | CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | CVEN 3414-3<br>Fund of Envir Engin | Envir Scien Elective-3 |
| | **18 H&SS (6 cr or more must be 3000+)** | | Envir Engr Elec-3<br>☐ CHEN 4650 Part Tech<br>☐ CHEN 4670 Env Sep<br>☐ CHEN 4838 Eng Fund<br>☐ CHEN 3840/4840 In St | *Envir Engr Elective-3 | *Envir Engr Elective-3 |
| | 1-<br>2-<br>3- | 4-<br>5-<br>Writing Requirement | | | |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

**Environ Science Electives:**
GEOL 1010 (3) Intro to Geol
GEOL 1060 (3) Global Change 1
GEOL 1001 (4) Environ Sys 1
GEOL 1011 (4) Environ Sys 2

*** Additional Environmental Engineering Electives on curriculum sheet**
*** Advanced Chem Electives on curriculum sheet**

# Materials Option Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4011-3<br>Modern Inorganic<br>P: CHEN 4521 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics**<br>PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| **4 cr Free Electives** | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)** | | |
| | | | CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | CHEN 3000+-3 | CHEN 3000+-3 |
| | **18 H&SS (6 cr or more must be 3000+)** | | Materials Elective-3 | Materials Elective-3 | Tech Elective-3 |
| | 1-<br>2-<br>3- | 4-<br>5-<br>Writing Requirement | | | |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

**Suggested Materials Electives:**
CHEN 4450 (3) Polymer Chemistry
CHEN 4460 (3) Polymer Engineering
CHEN 4650 (3) Particle Technology
CHEN 4836 (3) Nanomaterials
ASEN 4012 (3) Aerospace Materials
*MCEN 2024 (3) Materials Science
*If CHEN 4440 is taken, MCEN 2024 cannot be taken

# Pre Med Chemical Engineering Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4330-3 S<br>Kinetics<br>P: CHEN 3320<br>P: APPM 2360 | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4611-3<br>Survey of Biochem<br>(alt CHEM 4711/4731)<br>P: CHEM 3311 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4130-2 F<br>ChE Lab 2<br>P: CHEN 3130<br>P: CHEN 3220<br>P: CHEN 3320<br>P: CHEN 4330 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics** | | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) | CHEN 4440-3 S<br>Materials<br>P: CHEM 3311<br>P: CHEN 3320 |
| | PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | | | |
| **Adtl Gen Chem** | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110 | PHYS 1140-1<br>Experimental Lab | **16 cr Tech Electives (6 cr must be CHEN 3000+)** | | |
| CHEM 1133/1134<br>Gen Chem2 and Lab | | | CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | MCDB 2150-3<br>Genetics<br>and<br>MCDB 2151-1<br>Genetics Lab | MCDB 1151-1<br>Cellular Bio Lab |
| | **18 H&SS (6 cr or more must be 3000+)** | | Tech Elective-3 | Tech Elective-3<br>CHEN 3000+ | Tech Elective-3<br>CHEN 3000+ |
| | 1-<br>2-<br>3- | 4-<br>5-<br>Writing Requirement | | | |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

# Chemical and Biological Engineering Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | ChemE Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | CHEN 2810-3 S<br>Bio for Engineers<br>(alt MCDB 1150 or EBIO 1210/1220) | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4805-3 S<br>Biomaterials<br>P: CHEM 3311<br>P: CHEN 2810 (MCDB 1150)<br>(EBIO 1210 and 1220) | CHEN 4830-3 S<br>Biokinetics<br>P: CHEN 2810<br>P: CHEN 3320<br>P: APPM 2360 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4611-3<br>Survey of Biochem<br>(alt CHEM 4711/4731)<br>P: CHEM 3311 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4810-2 F<br>CBEN Lab 2<br>P: CHEN 2810<br>P: CHEN 3130<br>P: CHEN 4830<br>C: CHEN 4820 | CHEN 4820-3 F<br>Bioseparations<br>P: CHEN 3220 |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | **Physics** | | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4830 (CHEN 4330) | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| | PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | No lab for Physics 1 | | | |
| CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110<br>C: APPM 1360 | PHYS 1140-1<br>Experimental Lab<br>P: PHYS 1110<br>P/C: PHYS 1120 | **13 cr Tech Electives** | | |
| | | | CHEN 1300-1 S<br>Intro to ChemE<br>Not Required | Tech Elecvtive-3 | Tech Elective-3 |
| **4 cr Free Electives** | **18cr H&SS (6 cr must be 3000+)** | | | | |
| | 1-<br><br>2-<br><br>3- | 4-<br><br>5-<br><br>Writing Requirement | Tech Elective-3 | Focus Tech Elective-3<br>☐ Pharm Bio<br>☐ Tissue Engin<br>☐ Metabolic Engin | |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite

# Pre Med Chemical and Biological Engineering Graduation Checklist

Name: _____ Date: _____ MAPS OK ☐

| Math/Computing | Chemistry | | Chem E Core | | |
|---|---|---|---|---|---|
| GEEN 1300-3<br>Computing<br>C: APPM 1350 | CHEN 1211-4<br>Chem for Engineers<br>C: CHEM 1221 | CHEM 1221-1<br>Chem Lab<br>C: CHEN 1211 | MCDB 1150-3<br>Intro to Cellular Bio | CHEN 2120-3<br>Mat & En Bal<br>P: GEEN 1300<br>P: CHEN 1211 | CHEN 3200-3 S<br>Fluids<br>(alt MCEN 3021)<br>P: CHEN 2120 (MCEN 2023)<br>P: APPM 2350<br>C: APPM 2360 |
| APPM 1350-4<br>Calc 1 | CHEM 1133-4<br>Gen Chem 2<br>P: CHEN 1211<br>C: CHEM 1134 | CHEM 1134-1<br>Gen Chem 2 Lab<br>C: CHEM 1133 | CHEN 3210-3 F<br>Heat Transfer<br>(alt MCEN 3022)<br>P: CHEN 3200 (MCEN 3021) | CHEN 3320-3 F<br>Thermodynamics<br>P: CHEN 2120<br>P: CHEN 4521<br>(CHEM 4511/4531) | CHEN 3220-3 S<br>Sep & Mass Trans<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3320 |
| APPM 1360-4<br>Calc 2<br>P: APPM 1350 | CHEM 3311-4<br>O Chem 1<br>P: CHEN 1211<br>C: CHEM 3321 | CHEM 3321-1<br>O Chem 1 Lab<br>C: CHEM 3311 | CHEN 3130-2 S<br>Junior Lab<br>P: CHEN 3010<br>P: CHEN 3200 (MCEN 3021)<br>P: CHEN 3210 (MCEN 3022)<br>P: CHEN 3320 | CHEN 4805-3 S<br>Biomaterials<br>P: CHEM 3311<br>P: CHEN 2810 (MCDB 1150)<br>(EBIO 1210 and 1220) | CHEN 4830-3 S<br>Biokinetics<br>P: CHEN 2810<br>P: CHEN 3320<br>P: APPM 2360 |
| APPM 2350-4<br>Calc 3<br>P: APPM 1360 | CHEM 3331-4<br>O Chem 2<br>P: CHEM 3311/3321<br>C: CHEM 3341 | CHEM 3341-1<br>O Chem 2 Lab<br>C: CHEM 3331 | CHEN 4090-1 F<br>Sr Seminar | CHEN 4810-2 F<br>CBEN Lab 2<br>P: CHEN 2810<br>P: CHEN 3130<br>P: CHEN 4830<br>C: CHEN 4820 | CHEN 4820-3 F<br>Bioseparations<br>P: CHEN 3220 |
| APPM 2360-4<br>Lin Alg & Diff Eq<br>P: APPM 1360 | CHEN 4521-3 S<br>P Chem for Engineers<br>(alt CHEM 4511/4531)<br>P: CHEN 1211<br>P: APPM 2350<br>C: APPM 2360 | CHEM 4611-3<br>Survey of Biochem<br>(alt CHEM 4711/4731)<br>P: CHEM 3311 | CHEN 4520-3 F<br>Design<br>P: CHEN 3210<br>P: CHEN 3220<br>P: CHEN 4830 (CHEN 4330) | CHEN 4530-2 S<br>Design Project<br>P: CHEN 4520 | CHEN 4570-4 S<br>Process Control<br>P: APPM 2360<br>P: CHEN 3220<br>P: CHEN 4330 (CHEN 4830) |
| CHEN 3010-3 F<br>App Data Analysis<br>P: GEEN 1300<br>P: APPM 2360 | **Physics** | | | **18 cr H&SS (6 cr must be 3000+ & 1 Lit Class)** | |
| | PHYS 1110-4<br>Physics 1<br>C: APPM 1350 | PHYS 1120-4<br>Physics 2<br>P: PHYS 1110<br>C: APPM 1360 | PHYS 1140-1<br>Experimental Lab<br>P: PHYS 1110<br>P/C: PHYS 1120 | 1-<br>2-<br>3- | 4-<br>5-<br>Writing Requirement |
| **13 cr Technical Electives** | | | | | |
| CHEN 1300-1 S<br>Intro to Chem E<br>Not Required | MCDB 2150-3<br>Genetics<br>MDCB 2151-1<br>Genetics Lab | MCDB 1151-1 F<br>Cellular Bio Lab<br>(EBIO 1230 and 1240)<br>Gen Bio Lab 1 and Lab 2 | Tech Elective-4 | Focus Tech Elective<br>☐ Pharm Bio<br>☐ Tissue Engin<br>☐ Metabolic Engin | |

F = course offered in fall only
S = course offered in spring only
P = Prerequisite
C = Co-requisite