

ChBE HELP GUIDE

An Advising Guide for
Undergraduate Students in
the Department of Chemical and
Biological Engineering
at the University of Colorado

Academic Year
2010-2011

Department of
Chemical and Biological Engineering
University of Colorado
Boulder, CO 80309-0424

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Advising in Chemical and Biological Engineering at CU Boulder

Welcome! to Chemical and Biological Engineering at CU Boulder. The Department now has two degree programs at the Bachelor's level, a B.S. in Chemical Engineering (ChE) and a B.S. in Chemical and Biological Engineering (ChBE). Both degrees provide excellent training in traditional chemical engineering fields with the chemical and biological engineering degree offering targeted, extra training in the biological engineering aspects of the chemical engineering field. Students entering CU after Fall 2006 have the new degree available to them. Students currently in CHEN who wish to switch to CBEN need to do so with a change of major form.

This Guide has been prepared to help you, the student, as you progress through our undergraduate chemical engineering or chemical and biological engineering curriculum. The faculty and staff of the Department of Chemical and Biological Engineering want your educational experience here to be the best possible, and we share the responsibility with you to achieve this goal. You can help by reading this Guide thoroughly and by consulting with your advisor in a timely manner on questions and issues you have regarding your academic plan and career objectives.

Chemical and biological engineering is a broad field that encompasses many industries and activities. We present in this Guide a brief overview of chemical and biological engineering and references to additional sources of information. As a chemical and biological engineering student, you should educate yourself about the ChE profession and career opportunities¹.

The undergraduate ChE and ChBE curricula are dynamic plans. The Department's faculty are continually reviewing the curricula and making revisions where we believe improvements can be made. It is important that you stay updated on these

revisions, and accessing and reading the latest version of this Guide will help. Do not depend on advice from other students or advice based on hearsay. Your best practice is to consult your faculty advisor. It is also wise to have the key results of your advising session noted and placed in your Departmental file.

In addition to your Departmental file, you have a hanging file in the rack outside the ChBE Office (ECCH 111). This file system is used to distribute important notices regarding advising, policies, and events. Get in the habit of checking your hanging file several times per week.

Advising is an ongoing activity. You must consult with your advisor at least once per semester as you make decisions on which courses to take the next semester. Beyond that mandatory advising meeting, you should feel free to ask for help at other times. Faculty advisors are also willing to talk over career alternatives and plans with you. Remember, advisors are there to listen to you and help you, but you must make the effort to ask their help.

The Boulder Campus provides additional advising and counseling resources that you may wish to use. These are noted in this Guide and ChBE advisors may suggest them to you.

The Help Guide contains the academic and career advising matrices. Use these to find the appropriate advisor to see. If you have any problems connecting with your advisor, consult with the Departmental staff.

The standard ChE curriculum, the curriculum for the new Chemical and Biological Engineering degree, the five options [computing, environmental, materials, microelectronics & bioengineering], and the pre-medicine curricula for each degree program are presented here. The Cooperative Education (Co-op) curriculum plans are also described. Rules you need to know regarding the ChE and ChBE Bachelor of

¹ <http://www.aiche.org/spins/careers#careers>

Science degree program and policies on academic progress are listed.

The Humanities and Social Science (H&SS) elective policy is included as are descriptions of special academic programs such as minors in other academic fields, Senior Thesis, Study Abroad, and the Herbst Program of Humanities. There is a Q&A section to deal with often-asked questions, as well as useful forms for curriculum planning.

You, the student, can help the Department of Chemical and Biological Engineering in its efforts to provide you with good advice by giving us feedback on this document and other aspects of the advising program. We are eager to receive your constructive suggestions and will do our best to respond to them. Please email suggestions to Dr. Nuttelman.

We want your academic career and experience at CU Boulder to be memorable and of high quality. You, working together with the Department's faculty and staff, can make this happen.

The Chemical Engineering and Chemical and Biological Engineering Professions

*What is Chemical and Biological Engineering?*²

Modern technologies require the ability to produce specially designed chemicals, and the materials based on them, economically and with minimal adverse impact on the environment. Developing this ability and implementing it on a practical scale is what chemical engineering is all about.

Chemical and biological engineering is distinguished from the other engineering disciplines (mechanical, electrical, civil, aerospace, architectural, ...) primarily by its focus on chemical transformation -- creating new products of use to mankind through chemical reactions between raw materials or intermediates. Such products require purification and packaging for distribution and raw materials require proper handling and preparation. Chemical engineers must deal with all these aspects and more.

Imagine a world where penicillin and other antibiotics are rarer and more expensive than the finest diamonds. Imagine countries worldwide gripped by famine as dwindling supplies of natural guano and saltpeter cause fertilizers to become increasingly scarce. Imagine hospitals and clinics where kidney dialysis is as risky and as uncertain over the long term as are today's artificial heart replacements. Imagine serving on a police force or in the army without a lightweight bulletproof vest. Imagine your closet with no wash-and-dry, wrinkle-free garments, or your home without durable, easy-cleaning, mothproof carpets. Imagine cities choked with the smog and soot from millions of automobiles without emission controls. Imagine an "information society" trying to function using vacuum tubes for processing and ferrite core memory devices. Imagine paying \$25 or more for a gallon of gasoline, even if you could buy it, and using it at a rate of 12 miles per gallon because your all-metal vehicle is so heavy. Such a world, in which no one would want to live, is what we would

face if it weren't for the efforts of chemical engineers.

Chemical and biological engineering has a rich past and a bright future. One hundred years ago there were virtually no chemical engineers. In barely a century, its practitioners have developed and erected the technological infrastructure of much of modern society. Without their contributions, industries as diverse as petroleum processing, pharmaceutical manufacturing, food processing, textiles, and chemical manufacturing would not exist as we know them today.

Chemical and biological engineers have made so many important contributions to society that it is difficult to visualize modern life without the large-volume production of antibiotics, fertilizers and agricultural chemicals, special polymers for biomedical devices, high-strength polymer composites, and synthetic fibers and fabrics. How would our industries function without environmental control technologies, without processes to make semiconductors, magnetic disks and tapes, and optical storage devices, and without modern petroleum processing?

What Are the Job Opportunities in Chemical and Biological Engineering?

Chemical engineering occupies a special place among scientific and engineering disciplines. It is an engineering field with roots in the world of atoms, molecules, and chemical transformations. The principles and approaches that make up chemical engineering have a long history of contributions to the world's technological needs. Chemical engineers play a key role in many industries: petroleum, food, synthetic fibers, petrochemicals, plastics, ceramics, metals, glass, pharmaceuticals, and specialty chemicals. All these depend on chemical engineers to tailor manufacturing technology to the requirements of their products.

² Adapted from *Frontiers in Chemical Engineering: Research Needs and Opportunities*, U. S. National Research Council, National Academy Press, Washington, D. C., 1988.

A Bachelor of Science degree in chemical engineering or chemical and biological engineering prepares you for a professional career in many industries. A recent report provides the breakdown in the table below for the employment of recent BS ChE graduates.³

Biotech. & Pharm.	10%
Chemicals	31%
Eng'g Services	8%
Electronics	4%
Environment	4%
Food & Cons. Prod.	11%
Energy & Fuels	21%
Materials	2%
Other	9%

Many of these jobs involve technical challenges, using the principles learned in your curriculum, to design and operate chemical and manufacturing processes. Others involve business management, economic evaluation, and sales. Approximately 20% of chemical engineering graduates go on to graduate or professional school in order to prepare themselves for medical, research or teaching careers. All career paths for chemical engineers place a premium on communication skills, both oral and written. There are virtually no highly successful chemical engineers who are not excellent communicators.

Job opportunities for chemical engineers tend to follow the cycles of the economy. During good economic times, BS ChE graduates may have many job offers from which to choose. During bad times, jobs may be difficult to find. A few years of practical experience will generally add to your ability to find employment. It is not good practice to predict your own first job opportunities based on today's economic conditions, since there may be substantial change by the time you graduate. Such is the world we live in.

You can improve your chances for full-time employment following graduation by achieving your academic potential, improving your inter-personal and communications skills, and by seeking summer or part-time internship jobs.

What are the Frontiers in Chemical Engineering?

Chemical engineers have an important role to play in bringing new technologies to commercial implementation. These technologies have their origin in scientific discoveries on the molecular scale. Chemical engineers understand the molecular world and are skilled in integrating product design with process design, process control, and optimization. Using these skills, some of the new frontiers to which chemical engineers will contribute increasingly are:

- biotechnology and public health
- electronic, photonic, and recording devices
- advanced materials
- energy resources and their processing
- environmental protection and remediation

The work of chemical engineers over the past decades has moved more and more from large scale to molecular scale. Current developments in nanoscale phenomena and cellular and sub-cellular biology mark this trend. Chemical engineers are embracing this trend while continuing their strong contributions in more traditional areas.

What are the Characteristics of Chemical Engineering Graduates?

- 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
- an ability to function on multi-disciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in a global 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

³ www.aiche.org, 2003.

How and When to Get Advising

In Chemical and Biological Engineering, we find that advising generally falls into one of three categories:

- academic
- career
- personal

It is an important part of the ChBE faculty's mission to provide you with academic and career advising. You may or may not find it acceptable and comfortable to seek personal advising from the Department's faculty, and faculty may suggest that you obtain counseling on personal matters elsewhere. If you are facing a personal crisis, the Department recommends strongly that you do seek assistance, and we want to help you however we can, but you must realize that we, as faculty, are not trained in personal counseling. Personal counseling may be obtained from Counseling and Psychological Services, 134 Willard, 2-6766.

All undergraduate students in the Department of Chemical and Biological Engineering should subscribe to the "che-undergrad" email list in order to receive timely information on advising and opportunities. See the ChBE Office if you need assistance in subscribing.

Academic Advising

For general advising questions and FAQs during the academic year, go to:

<http://cbenadvising.pbwiki.com>

You must seek and receive academic advising each semester prior to registering for the next semester's courses; otherwise, a stop will be placed on your record preventing you from registering. This is to ensure that you stay on course to the completion of your degree program. Your advisor is selected according to your current class standing in ChBE, which is based on what courses you are taking and not based on the number of credit hours on your transcript. Advisors can be selected online at:

<http://www.mysignup.com/advisorselection>

However, if you are planning to study abroad or fill pre-med requirements, please see David Clough or Janet deGrazia, respectively.

Know who your advisor is! Remember! You can seek advice at any time, not just during registration periods. If you find it more comfortable to discuss matters with a particular faculty member, feel free to seek them out. If you cannot seem to get the help you need, consult with Charlie Nuttelman.

Faculty advisors may have sign-up sheets outside their offices during peak advising periods. At other times, you should make an appointment for advising. Keep in mind that, just as you are a busy student, faculty generally have hectic schedules. Don't expect them to be able to see you on a drop-in basis – make an appointment. Go prepared to your advising appointment: check out your file from the ChBE office and, if possible, have your questions formulated in advance.

List of Faculty Names, Offices, Phones, and Email Addresses

Name	Office ⁴	Phone ⁵	Email ⁶
Kristi Anseth	ECCH 128	492-3147	Kristi.Anseth
Christopher Bowman	ECCH 108	492-3247	Christopher.Bowman
Stephanie Bryant	ECCH 118	735-6714	Stephanie.Bryant
David Clough	ECCH 126	492-6638	David.Clough
Rob Davis	ECAD 136	492-7314	Robert.Davis
Janet deGrazia	ECCH 120	735-4763	degrazia
John Falconer	ECCH 132	492-8005	John.Falconer
Steve George	EKLC-W145B	492-3398	Steven.George
Ryan Gill	DLC 1B77	492-2627	rtg
Doug Gin	ECCH 138	492-7640	Douglas.Gin
Christine Hrenya	ECCH 130	492-7689	Hrenya
Arthi Jayaraman	ECCH 110	492-3087	Arthi.Jayaraman
Dhinakar Kompala		492- 6350	Dhinakar.Kompala
Joel Kaar	ECCH 114	492- 6031	Joel.Kaar
Bev Louie	ECCE 110	492-4967	Beverly.Louie
Melissa Mahoney	ECCH 134	492-3573	Melissa.Mahoney
Will Medlin	DLC 1B09	492-2418	Will.Medlin
Charles Musgrave	ECCH 112	735-0411	Charles.Musgrave
Richard Noble	ECCH 122	492-6100	Nobler
Charles Nuttelman	ECCH 124	492-2510	Charles.Nuttelman
Ted Randolph	ECCH 116	492-4776	Theodore.Randolph
Robert Sani	ECCH 103A	492-5517	Robert.Sani
Aaron Saunders	ECCH 101	492-0722	Aaron.Saunders
Dan Schwartz	ECCH 103B	735-0240	Daniel.Schwartz
Mark Stoykovich	ECCH 136	492-6522	Mark.Stoykovich
Al Weimer	DLC 1B79	492-3759	Alan.Weimer
Wendy Young	ECCH 113	492-8721	Wendy.Young

Department of Chemical and Biological Engineering: Contact Information

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 Boulder, CO 80309-0424
Phone: 303-492-7471 **FAX No.:** 303-492-4341
WWW Home Page: <http://www.Colorado.EDU/engineering/che/>

⁴ The Chemical Engineering wing (CH) is located at the south end of the Engineering Center (EC).

⁵ If calling from off campus, precede these numbers with 303. If calling from on campus, dial only the last five numbers.

⁶ The full email address, for network access, includes the suffix @colorado.edu .

Mission and Vision of the Undergraduate Program

Mission Statement of the B.S. degree program in Chemical 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 that will serve a broad and dynamic range of career paths and provide a foundation for lifelong professional growth.

Mission Statement of the B.S. degree program in 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 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 institution, 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 program in Chemical Engineering at the University of Colorado is entirely consistent with the institutional mission, yet narrower in scope. Our focus is to collaborate with our students to serve their needs and prepare them for rewarding and varied careers.

The program is seen as a collaboration with students, rather than a dispensation of education to students. This is evidenced by the extent of participation of students in many aspects of the program: instruction, mentoring, assessment, and feedback.

The program is a *blend* of chemical engineering principles and practice. In this way, we equip our graduates with tools and skills to make them immediately useful in the workplace, yet these are sustained by a foundation of principles that transcend the temporal nature of tools and skills.

The program is *broad* in nature and is designed to prepare students for a wide range of career paths and career changes. The program also recognizes the learning that is ongoing during the careers of our graduate, and educates students with lifelong learning in mind.

The University of Colorado is a *research* institution. The Department of Chemical and Biological Engineering involves a majority of our undergraduate students in our research programs, either for academic credit (independent study, senior thesis) or pay (Undergraduate Research Opportunities Program, Research Experiences for Undergraduates Program). This involvement represents a consistency of mission.

Although the University of Colorado is a large institution with many benefits associated with this size, such as diversity of program offerings, the Department of Chemical and Biological Engineering strives to provide a *home environment* for its undergraduate students where they are known, guided, and cared for. This environment is represented in a formal way by our advising program and in a less formal way by the congenial, open-door atmosphere in the Department.

Chemical Engineering Curricula and Objectives

Program Objectives

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

- be recognized as academic and industrial leaders in a multitude of chemical 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, our graduates 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.

There are eight curriculum plans for the Bachelor of Science degree in Chemical Engineering at the University of Colorado. These are:

- standard curriculum
- computer option
- environmental option
- energy option
- materials option
- microelectronics option
- bioengineering option
- pre-medicine curriculum
- Cooperative Education study plans

The courses of the ChE curricula are divided into four categories:

- required technical courses (88 cr hrs)
- technical and chemistry electives (18 cr hrs)
- humanities & social science (H&SS) courses, including electives (18 cr hrs)
- free electives (4 cr hrs)

The standard 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 option. The pre-medicine curriculum satisfies the typical requirements for admission to medical school. All curricula are accredited by the Engineering Accreditation Commission of ABET <http://www.abet.org>." If you complete the requirements of one of the options, you will receive a certificate from the Department in addition to your University diploma. 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. Free electives may be chosen from either the technical or H&SS categories and provide you with the opportunity to add emphasis to one or more aspects of your curriculum.

Because of varied student interests and backgrounds, most students do not follow any one of the curricula exactly. There are always changes and adjustments made. This is where advising becomes important. Any variations from the prescribed curricula must be approved by the Department through one of its advisors. Additionally, the curriculum plans are revised frequently. You need always to be working with the most recent edition of this Guide. Curriculum changes are always made in a way that current students will not be penalized.

Standard ChE Undergraduate Curriculum

The Standard Curriculum for the Bachelor of Science degree in Chemical Engineering at the University of Colorado has been designed to meet or exceed national standards for undergraduate chemical engineering curricula. The Standard Curriculum presented in the chart below contains courses in mathematics and the basic sciences, computing, chemical engineering, and humanities & social sciences. There are several courses shown as Elective in the chart. These are either technical or free electives (see special section on these). The elements of the Standard Curriculum are included in the specialized curricula that follow. The latter specify the elective courses in order to provide a specialization in the theme of the option.

Standard Curriculum

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1 ⁶	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem for Eng	5	Biol Engr ⁵	3	OChem 1	5	OChem 2	5
Computing	3	Phys 1	4	MatEnBal	3	PChem Engr	3
H&SS	3	Intro ChE	1	Phys 2	4	ChE Fluids	3
		H&SS	3	Phys Lab	1	H&SS	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	ChemElect ¹	3	Design	3	Design Proj	2
ChE Heat Tfr	3	ChE Lab 1	2	ChE Lab 2	2	Control	4
WRTG ³	3	Kinetics	3	Elective ²	3	ChE Mat'ls ⁴	3
ChE Thermo	3	ChE Sep/Mass	3	Elective ²	3	Elective ²	3
Elective	4	Elective ²	3	H&SS	3	Elective ²	3
		H&SS	3	Sr Seminar	1		
Total	16	Total	17	Total	15	Total	15

¹Approved Chemistry Electives

Inorganic - 3
 InstAnaly - 3
 PChem2 - 3
 Adv Pchem - 3
 Biochem1 - 3
 Biochem2 - 3
 Survey Biochem - 3
 Biochem Lab - 4

Total Credit Hours: 128

²Six credit hours must be CHEN 3000+

³Alternates are HUEN 3100, GEEN 3000 or WRTG 3035

⁴CHEN 4440 or CHEN 4460

⁵Alternates are MCDB 1150 or EBIO 1210 and 1220

⁶Alternate is APPM 1340 and 1345

The table on the following page provides the complete course numbers and titles for the short-hand notation used in the chart above.

Course Notation	Course Number	Credit Hours	Title
App Data	CHEM 3010	3	Applied Data Analysis
Biochem 1	CHEM 4711	3	General Biochemistry 1
Biochem 2	CHEM 4731	3	General Biochemistry 2
Biochem Lab	CHEM 4761	4	Biochemistry Laboratory
Biol Engr	CHEM 2810	3	Biology for Engineers
Calc 1	APPM 1350	4	Calculus 1 for Engineers
Calc 2	APPM 1360	4	Calculus 2 for Engineers
Calc 3	APPM 2350	4	Calculus 3 for Engineers
ChE Lab 1	CHEM 3130	2	Chemical Engineering Laboratory 1
ChE Lab 2	CHEM 4130	2	Chemical Engineering Laboratory 2
ChE Mats	CHEM 4440	3	Chemical Engineering Materials
ChE Fluids	CHEM 3200	3	Chemical Engineering Fluid Mechanics
ChE Heat Tfr	CHEM 3210	3	Chemical Engineering Heat Transfer
ChE Sep/Mass	CHEM 3220	4	Chemical Engineering Separations and Mass Transfer
ChE Thermo	CHEM 3320	3	Chemical Engineering Thermodynamics
Chem	CHEM 1211	3	General Chemistry for Engineers
	CHEM 1221	2	General Chemistry Laboratory for Engineers
Computing	GEEN 1300	3	Introduction to Engineering Computing
Control	CHEM 4570	4	Instrumentation and Process Control
Design	CHEM 4520	3	Chemical Process Synthesis
Design Proj	CHEM 4530	2	Chemical Engineering Design Project
Elective	various	≈3	Technical or free elective course See Technical Elective section of this Guide
H&SS	various	≈3	Humanities and Social Science course see H&SS section of this Guide
	HUEN 3100	3	Humanities for Engineers 1
	HUEN 3200	3	Humanities for Engineers 2
Inorganic	CHEM 4011	3	Modern Inorganic Chemistry
InstAnaly	CHEM 4171	3	Instrumental Analysis
IntroChE	CHEM 1300	1	Introduction to Chemical Engineering
Kinetics	CHEM 4330	3	Chemical Engineering Reaction Kinetics
LinAlgODE	APPM 2360	4	Introduction to Linear Algebra and Differential Equations
MatEnBal	CHEM 2120	3	Chemical Engineering Material and Energy Balances
OChem 1	CHEM 3311	4	Organic Chemistry 1
	CHEM 3321	1	Laboratory in Organic Chemistry 1
OChem 2	CHEM 3331	4	Organic Chemistry 2
	CHEM 3341	1	Laboratory in Organic Chemistry 2
PChem Engr	CHEM 4521	3	Physical Chemistry for Engineers
PChem 2	CHEM 4531	3	Physical Chemistry 2
Phys 1	PHYS 1110	4	General Physics 1
Phys 2	PHYS 1120	4	General Physics 2
Phys Lab	PHYS 1140	1	Experimental Physics 1
Poly Engr	CHEM 4460	3	Polymer Engineering
Sr Seminar	CHEM 4090	1	Chemical Engineering Undergraduate Seminar
Survey Biochem	CHEM 4611	3	Survey of Biochemistry
WRTG	WRTG 3030	3	Advanced Composition: Writing on Science and Society (H&SS credit)

Computer Option

The Computer Option coordinates electives in computer science and engineering in order to provide the student with an enhanced background in the application of computers in the chemical engineering profession. Particular emphasis is placed on an understanding of microcomputers and their direct interfacing to chemical processes for the purposes of on-line monitoring and control.

Computer Option

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem	5	Prog ¹	4	OCHEM 1	5	ChE Fluids	3
Computing	3	Phys 1	4	MatEnBal	3	DataStruc ²	4
H&SS	3	Intro ChE	1	Phys 2	4	PChem Engr	3
	—	Biol Engr	3	Phys Lab	1	H&SS	3
Total	15	Total	16	Total	17	Total	17
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
Computers or		ChE Lab 1	2	Design	3	Design Proj	2
Digital Logic ²	5	Kinetics	3	ChE Lab 2	2	Control	4
AppData	3	ChE Sep/Mass	3	H&SS	3	ChE Mat'ls	3
ChE Heat Tfr	3	OCHEM 2	5	ChemElect	3	H&SS	3
WRTG	3	H&SS	3	Sr Seminar	1	Tech Elective ³	3
ChE Thermo	3		—	Tech Elective ³	3		—
Total	17	Total	16	Total	15	Total	15

Total Credit Hours: 128

¹Counts as free elective

²Counts as technical elective

³Six credit hours must be CHEN 3000

The following table provides the complete course numbers and titles for the shorthand notation used in the chart above.

Course	Course Number	Credit Hours	Title
Computers	ECEN 2120	5	Computers As Components
DigitalLogic	ECEN 3100	5	Digital Logic
Prog	CSCI 1300	4	Comp Sci I: Programming
DataStruc	CSCI 2270	4	Comp Sci II: Data Structures

Energy Option

The Energy Option is designed to provide the student with a set of technical courses that expand his or her knowledge in energy and engineering. In order to provide an enhanced background in specific energy fields within the chemical engineering profession, the Energy Option has been split into three core concentrations: fossil fuels or petroleum, photovoltaics and biofuels.

Energy Option – Fossil Fuels or Petroleum Focus

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem for Eng	5	Biol Engr ⁵	3	OChem 1	5	OChem 2	5
Computing	3	Phys 1	4	MatEnBal	3	PChem Engr	3
H&SS	3	Intro ChE	1	Phys 2	4	ChE Fluids	3
		H&SS	3	Phys Lab	1	Intro Geol ¹	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	H & SS	3	Design	3	Design Proj	2
ChE Heat Tfr	3	ChE Lab 1	2	ChE Lab 2	2	Control	4
WRTG	3	Kinetics	3	H & SS	3	H & SS	3
ChE Thermo	3	ChE Sep/Mass	3	Energy Funds	3	En Elective ^{1,2,3}	3
En Elective ^{1,2,3}	4	En Elective ^{1,2,3}	3	PChem 2	3	En and Environ	3
		Materials	3	Sr Seminar	1		
Total	16	Total	17	Total	15	Total	15

¹counts as a technical elective

²one must be CHEN 3000+ independent study

³suggested electives:

CVEN 3698-3	Engineering Geology
MCEN 4152-3	Intro to Combustion
MCEN 4162-3	Energy Conversion
GEOL 3540-3	Intro to Hydrocarbon geology
GEOL 3010-3	Intro to Mineralogy
GEOL 3020-3	Intro to Petrology
GEOL 3320-3	Intro to Geochemistry

The following table provides the complete course numbers and titles for the shorthand notation used in the chart above.

Course	Course Number	Credit Hours	Title
Intro Geol	GEOL 1010	3	Introduction to Geology 1
Energy Funds	CHEN 4838	3	Energy Fundamentals
En and Environ	ENVS 3070 or PHYS 3070	3	Energy and the Environment

Energy Option - Photovoltaic Focus

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem for Eng	5	Biol Engr ⁵	3	OChem 1	5	OChem 2	5
Computing	3	Phys 1	4	MatEnBal	3	PChem Engr	3
H&SS	3	Intro ChE	1	Phys 2	4	ChE Fluids	3
		H&SS	3	Phys Lab	1	Circuits ¹	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	H & SS	3	Design	3	Design Proj	2
ChE Heat Tfr	3	ChE Lab 1	2	ChE Lab 2	2	Control	4
WRTG	3	Kinetics	3	H & SS	3	H & SS	3
ChE Thermo	3	ChE Sep/Mass	3	Energy Funds	3	En Elective ^{1,2,3}	3
Physics 3/lab ¹	4	En Elective ^{1,2,3}	3	Inorganic Chem	3	En and Environ	3
		Materials	3	Sr Seminar	1		
Total	16	Total	17	Total	15	Total	15

¹counts as a technical elective

²one must be CHEN 3000+ independent study

³suggested electives:

ECEN 3320-3 Semiconductor Devices

MCEN 4162-3 Energy Conversion

ECEN 4345-3 Introduction to Solid State

CHEN 3000+ Independent Study

The following table provides the complete course numbers and titles for the shorthand notation used in the chart above.

Course	Course Number	Credit Hours	Title
Phys 3	PHYS 2130	3	General Physics 3
Phys 3 Lab	PHYS 2150	1	Experimental Physics
Circuits	ECEN 3030 or MCEN 3017	3	Electrical/Electronic Circuits for nonmajors/ Circuits & Electronics
Energy Funds	CHEN 4838	3	Energy Fundamentals
En and Environ	ENVS 3070 or PHYS 3070	3	Energy and the Environment
Inorganic Chem	CHEM 4011	3	Modern Inorganic Chemistry

Energy Option – Biofuels Focus

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem for Eng	5	Biol Engr ⁵	3	OChem 1	5	OChem 2	4
Computing	3	Phys 1	4	MatEnBal	3	OChem Lab 2	1
H&SS	3	Intro ChE	1	Phys 2	4	En and Environ	3
		H&SS	3	Phys Lab	1	PChem Engr	3
						ChE Fluids	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	H & SS	3	Design	3	Design Proj	2
ChE Heat Tfr	3	ChE Lab 1	2	ChE Lab 2	2	Control	4
WRTG	3	Kinetics	3	H & SS	3	H & SS	3
ChE Thermo	3	ChE Sep/Mass	3	Energy Funds	3	En Elective ^{1,2}	3
Genetics ¹	3	En Elective ^{1,2}	3	Biochem	3	En Elective ^{1,2}	3
Genetics Lab ¹	1	Materials	3	Sr Seminar	1		
Total	16	Total	17	Total	15	Total	15

¹counts as a technical elective

²suggested electives:

- MCEN 4162-3 Energy Conversion
- CHEN 4803-3 Metabolic Engineering
- CHEN 5360-3 Catalysis and Kinetics
- CHEN 3000+ Independent Study

The following table provides the complete course numbers and titles for the shorthand notation used in the chart above.

Course	Course Number	Credit Hours	Title
Genetics	MCDB 2150	3	Principles of Genetics
Genetics Lab	MCDB 2151	1	Principles of Genetics Lab
En and Environ	ENVS 3070 or PHYS 3070	3	Energy and the Environment
Energy Funds	CHEN 4838	3	Energy Fundamentals
Biochem	CHEM 4711	3	General Biochemistry 1

Environmental Option

Chemical engineers possess an educational background ideally suited to professional work in the environmental field. Their strong backgrounds in chemistry and chemical process design and operation separate them from civil and mechanical engineers. The Environmental Option is designed to provide you with a set of technical courses that expand your knowledge in environmental science and engineering.

Environmental Option

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem	5	Biol Engr	3	OChem 1	5	OChem 2	5
Computing	3	Phys 1	4	MatEnBal	3	PChem Engr	3
H&SS	3	Intro ChE	1	Phys 2	4	ChE Fluids	3
		H&SS	3	Phys Lab	1	FundEnvEn ¹	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	ChemElect	3	Design	3	Design Proj	2
ChE Heat Tfr	3	ChE Lab 1	2	ChE Lab 2	2	Control	4
WRTG	3	Kinetics	3	EnvEnEI 2 ^{1,2}	3	ChE Mat'ls	3
ChE Thermo	3	ChE Sep/Mass	3	H&SS	3	EnvEnEI 3 ^{1,2}	3
EnvSciEI	3	EnvEnEI 1 ^{1,2}	3	Elective	4	H&SS	3
		H&SS	3	Sr Seminar	1		
Total	15	Total	17	Total	16	Total	15

Total Credit Hours: 128

¹ Counts as technical elective

² At least one environmental elective must be CHEN 4670, CHEN 4650, CHEN 4838: Energy Fundamentals or CHEN independent study

Additional course numbers and titles for the shorthand notation used in the chart above are:

Course	Course Number	Credit Hours	Title
EnvSciEI	various	≈3	Environmental Science Elective Examples: GEOL 1010-3 Introduction to Geology 1 GEOL 1060-3 Global Change 1 GEOG 1001-4 Environmental Systems 1 GEOG 1011-4 Environmental Systems 2
FundEnvEn	CVEN 3414	3	Fundamentals of Environmental Engineering
EnvEnEI 1,2 & 3	various	≈3	Water pollution emphasis: CVEN 3424-3 Water and Wastewater Treatment CVEN 3454-4 Water Chemistry CVEN 4424-3 Aquatic Org Contam CVEN 4434-3 Environmental Engineering Design CVEN 4474-3 Hazardous & Industrial Waste Mgt CVEN 4484-3 Environmental Microbiology Air pollution emphasis: MCEN 4131-3 Air Pollution Control Chemical process emphasis: CHEN 4670-3 Environmental Separations CHEN 4650-3 Particle Technology CHEN 4838-3 Energy Fundamentals

Materials Option

Many chemical engineers find themselves working in areas that relate to materials engineering. Materials may be polymers, such as plastics and synthetic fibers, high tech composites, ceramics, or metals. The Materials Option allows you to bolster your knowledge in this area providing you with strong credentials for direct entry into the materials field.

Materials Option

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem	5	Biol Engr	3	OChem 1	5	OChem 2	5
Computing	3	Phys 1	4	MatEnBal	3	PChem Engr	3
H&SS	3	Intro ChE	1	Phys 2	4	ChE Fluids	3
		H&SS	3	Phys Lab	1	H&SS	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	ChE Lab 1	2	Design	3	Design Proj	2
ChE Heat Tfr	3	Kinetics	3	ChE Lab 2	2	Control	4
WRTG	3	ChE Sep/Mass	3	Tech Elective ³	3	Mat'Is EI 3 ¹	3
ChE Thermo	3	ChE Mat'Is ²	3	Inorganic	3	H&SS	3
Mat'Is EI 1 ¹	3	H&SS	3	Mat'Is EI 2 ¹	3	Free Elective	4
		Tech Elective ³	3	Sr Seminar	1		
Total	15	Total	17	Total	15	Total	16

¹ One Mat'Is EI must be an Independent Study course.

Total Credit Hours: 128

² CHEN 4460 or CHEN 4440

³Six credit hours must be CHEN 3000+

Suggested materials electives include:

Course Number	Credit Hours	Title
CHEN 4450	3	Polymer Chemistry
CHEN 4460	3	Polymer Engineering
CHEN 4650	3	Particle Technology
CHEN 4836	3	Nanomaterials
MCEN 2024*	3	Materials Science
ASEN 4012	3	Aerospace Materials

*MCEN 2024 cannot be taken if CHEN 4440 is also taken.

Microelectronics Option

The manufacture of semiconductor microelectronic circuits, "*chips*," involves many chemical steps. In recent years, more and more chemical engineers are finding employment in the expanding microelectronics industry. Completion of this option provides specialization that will help launch a successful career in microelectronics.

Microelectronics Curriculum

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem	5	Biol Engr	3	OChem 1	5	OChem 2	5
Computing	3	Phys 1	4	MatEnBal	3	PChem Engr	3
H&SS	3	Intro ChE	1	Phys 2	4	ChE Fluids	3
		H&SS	3	Phys Lab	1	Phys 3 ²	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	ChE Lab 1	2	Design	3	Design Proj	2
ChE Heat Tfr	3	Kinetics	3	ChE Lab 2	2	Control	4
ChE Thermo	3	Tech Elective ¹	3	Free Elective	3	ChE Mat'ls	3
Circuits ²	3	ChE Sep/Mass	3	Inorganic	3	Tech Elective ¹	3
Phys 3 Lab ²	1	H&SS	3	Focus Tech EI ³	3	H&SS	3
H&SS	3	WRTG	3	Sr Seminar	1		
Total	16	Total	17	Total	15	Total	15

Total Credit Hours: 128

¹Six credit hours must be CHEN 3000+

²Counts as technical elective.

³Focus Tech Elective must be chosen from: Solid State, Devices, or Micro Struc (see below).

The following table provides the complete course numbers and titles for the shorthand notation used above.

Course	Course Number	Credit Hours	Title
Phys 3	PHYS 2130	3	General Physics 3
Phys 3 Lab	PHYS 2150	1	Experimental Physics
Circuits	ECEN 3030 or MCEN 3017	3	Electrical/Electronic Circuits for nonmajors/ Circuits & Electronics
Solid State	ECEN 4345	3	Introduction to Solid State
Devices	ECEN 3320	3	Semiconductor Devices
When offered, a recommended elective during the Senior year is:			
Micro Struc	ECEN 4375	3	Microstructures Laboratory

Bioengineering Option

The Bioengineering Option curriculum, often called the *Bio Option*, prepares the student for entry into various fields related to biochemical engineering and biotechnology. Chemical engineers who practice in these fields have found it necessary to acquire a significant supplement to their standard ChE curriculum. The Bio Option provides the courses for this supplement. Students considering entry to medical school may also elect to complete this option in addition to the Pre-Medicine Curriculum, which follows.

Bioengineering Curriculum

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem	5	Biol Engr	3	OChem 1	5	OChem 2	4
Computing	3	Phys 1	4	MatEnBal	3	OChem Lab 2	1
H&SS	3	Intro ChE	1	Physics 2	4	PChem Engr	3
		H&SS	3	Physics Lab	1	ChE Fluids	3
						H&SS	3
	—		—		—		—
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
AppData	3	Biochem1	3	Design	3	Design Proj	2
ChE Heat Tfr	3	ChE Lab 1	2	ChE Lab 2	2	Control	4
ChE Thermo	3	Kinetics	3	Tech Elective ²	3	ChE Mat'ls	3
Elective	4	ChE Sep/Mass	3	Bio Elect 2 ^{1,2}	3	Bio Elect 3 ^{1,2}	3
WRTG ³	3	Bio Elect 1 ^{1,2}	3	Sr Seminar	1	H&SS	3
		H&SS	3	Bioscience Elec.	3		
	—		—		—		—
Total	16	Total	17	Total	15	Total	15

Total Credit Hours: 128

¹ Two bio electives must be in ChE and chosen from
 CHEN 4801: Pharmaceutical Biotechnology
 CHEN 4803: Metabolic Engineering
 CHEN 4805: Biomaterials
 CHEN 4820: Bioseparations
 CHEN 4838: Tissue Engineering
 an Independent Study course

² Two technical electives must be CHEN 3000+.

³ Alternates are HUEN 3100, GEEN 3000 or WRTG 3035

Bioscience Elective

The Bioscience Elective should be chosen from the following courses:

MCDB 2150 Genetics
 EBIO 2070 Genetics
 CHEM 4791 Bioorganic Chemistry in Biotech.
 CHEM 5341 Chemical Biol. and Drug Design
 EBIO 3400 Microbiology
 CHEM 4731 Biochemistry 2
 MCDB 4615 Biology of Stem Cells

IPHY 3410 Human Anatomy
 IPHY 3430 Human Physiology
 IPHY 4200 Physiological Genetics and Genomics
 CHEM 4621 Genome Databases: Mining and Management

Pre-Medicine Chemical Engineering Curriculum

The Pre-medicine curriculum combines the requirements for the Bachelor of Science degree in Chemical Engineering with the typical requirements for admission to medical schools in the US. It is possible for students completing the Pre-medicine curriculum to complete also the Bioengineering option; however, this combination will require a greater number of credit hours than those listed for each. If you want additional advising on completing the pre-med curriculum, please see Janet deGrazia.

Premed Curriculum

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem	5	Chem 2 ³	5	OChem 1	5	Phys 2	4
Computing	3	Phys 1	4	MatEnBal	3	PChem Engr	3
H&SS Lit. ¹	3	Intro ChE	1	Intro MCDB	3	ChE Fluids	3
		H&SS Lit.	3	Intro MCDB Lab ⁴	1	Genetics ⁴	3
						Genetics Lab ⁴	1
Total	15	Total	17	Total	16	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring ³	
AppData	3	ChE Lab 1	2	Design	3	Design Proj	2
OChem 2	5	Kinetics	3	ChE Lab 2	2	Control	4
ChE Heat Tfr	3	Biochem 1	3	Tech Elective ²	3	ChE Mat'ls	3
ChE Thermo	3	ChE Sep/Mass	3	Tech Elective ²	4	Tech Elective ²	3
Phys Lab	1	H&SS	3	H&SS	3	H&SS	3
		WRTG	3	Sr Seminar	1		
Total	15	Total	17	Total	16	Total	15

Total Credit Hours:

129

¹ ENGL 1500 is a common choice – there are others

² Two of these electives must be CHEN 3000+

³ Counts as free elective

⁴ Counts as technical elective

Notes

- Pre-med students should take two courses in literature as part of their H&SS elective program.
- By the spring of their sophomore year, pre-med students should contact the Preprofessional Advisor in Old Main 1B-90, 735-3000, to receive guidance on their preparation for medical school.

Course	Course Number	Credit Hours	Title
Intro MCDB	MCDB 1150 or EBIO 1210	3	Intro to Cellular & Molecular Biology/General Biology 1
Intro MCDB Lab 1	MCDB 1151 or EBIO 1230	1	Intro to Cellular and Molecular Biology Lab/General Biology Lab 1
Genetics	MCDB 2150 or EBIO 1220	3	Principles of Genetics/General Biology 2
Genetics Lab	MCDB 2151 or EBIO 1240	1	Principles of Genetics Lab/General Biology Lab 2
Chem 2	CHEM 1131	5	General Chemistry 2

The Cooperative Education Program for Chemical Engineering

The Cooperative Education Program (Co-op Program) alternates academic terms with co-op work terms to provide students with real professional experience while completing the course requirements for the chemical engineering undergraduate degree. Co-op has been termed “the ultimate scholarship” because students can earn up to \$3,200/month during work terms. The co-op coordinator will work with co-op students to determine a schedule of courses and work assignments (two examples shown below) that will allow them to finish all course and co-op requirements in five years. Besides the standard curriculum examples shown below, students may follow the curriculum plans for one of the specialty options. Students may participate in the Co-op Program after successfully completing CHEN 2120, Material and Energy Balances, during their second (sophomore) year. 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 of \$650 for each work session through the College of Continuing Education. Up to 24 additional credit hours are required to complete the Co-op Program. The co-op student performs his or her duties off campus at a co-op employer’s place of business. At least three co-op assignments (preferably with the same employer) must be completed to earn a Certificate of Cooperative Education upon graduation.

Year	1st			2 nd			3rd			4th			5th	
	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring
Example Schedules														
Schedule A			INT		1		2		3			INT		
Schedule B			INT			1		2		3		INT		



Cooperative Education Program Curriculum Schedule A & B

First Year Fall		First Year Spring		First Year Summer	
Calc 1	4	Calc 2	4	Summer Internship (Optional)	
Chem Eng	5	Biol Engr	3		
Computing	3	Phys 1	4		
H&SS	3	Intro ChE	1		
		H&SS	3		
Total	15	Total	15		

Second Year Fall A & B	Second Year Spring A	Second Year Spring B	Second Year Summer - A	Second Year Summer - B
Calc 3 4	1 st Co-op Assignment, CHEN 3930	LinAlgODE 4	H&SS ² 3	1 st Co-op Assignment, CHEN 3930
OChem 1 5		OChem 2 5	H&SS ² 3	
MatEnBal ¹ 3		ChE Fluids 3		
Phys 2 4		PChem Engr 3		
Phys Lab 1				
Total 17		Total 15	Total 6	

Third Year Fall A	Third Year Fall B	Third Year Spring A	Third Year Spring B	Third Year Summer A & B
2 nd Co-op Assignment, CHEN 3930	AppData 3	LinAlgODE 4	2 nd Co-op Assignment, CHEN 3930	A - 3 rd Co-op Assignment, CHEN 3930
	ChE Heat Tfr 3	OChem 2 5		B - Courses
	WRTG 3	ChE Fluids 3		
	ChE Thermo 3	PChem Engr 3		H&SS ² 3
	Elective 3			H&SS ² 3
	—	—		—
	Total 15	Total 15		Total 6

Fourth Year Fall A	Fourth Year Fall B	Fourth Year Spring A	Fourth Year Spring B	Fourth Year Summer A & B
AppData 3	3 rd Co-op Assign- ment, CHEN 3930	ChE Lab 1 2	ChE Lab 1 2	4 th Co-op Assignment, CHEN 3930
ChE Heat Tfr 3		Kinetics 3	Kinetics 3	
WRTG 3		ChE Sep/Mass 3	ChE Sep/Mass 3	
ChE Thermo 3		ChemElect 3	ChemElect 3	
Elective 3		Elective 3	Elective 3	
—		—	—	
Total 15		Total 14	Total 14	

Fifth Year Fall A & B		Fifth Year Spring A & B	
Design 3		Design Proj 2	
ChE Lab 2 2		Control 4	
Elective 3		ChE Mat'ls 3	
Elective 3		Elective 3	
H&SS 3		Elective 4	
Sr Seminar 1			
—		—	
Total 15		Total 16	

¹ All students must successfully complete this course to participate in the Co-op Program.

² Suggested summer courses. Students can also complete required courses offered in the summer. Some alternatives include Organic Chemistry 2 and Physical Chemistry 1, which usually are offered in complementary summer sessions.

Chemical and Biological Engineering Curricula and Objectives

Program Objectives

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

- be recognized as academic and industrial leaders in a multitude of 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, our graduates 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.
- a knowledge of advanced biological concepts.

There are two curriculum plans for the Bachelor of Science degree in Chemical and Biological Engineering at the University of Colorado. These are:

- standard curriculum
- pre-medicine curriculum

The courses of the ChBE curricula are divided into three categories:

- required technical courses (94 cr hrs)
- technical electives (12 cr hrs)
- free electives (4 cr hrs)
- humanities & social science (H&SS) courses, including electives (18 cr hrs)

The standard curriculum provides you the most freedom in the choice of your technical elective courses. The pre-medicine curriculum satisfies the typical requirements for admission to medical school. The Chemical and Biological Engineering curriculum is accredited by the Engineering Accreditation Commission of ABET <http://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.

Because of varied student interests and backgrounds, most students do not follow any one of the curricula exactly. There are always changes and adjustments made. This is where advising becomes important. Any variations from the prescribed curricula must be approved by the Department through one of its advisors. Additionally, the curriculum plans are tentative at this time. You need always to be working with the most recent edition of this Guide. Curriculum changes are always made in a way that current students will not be penalized.

Chemical and Biological Engineering Curriculum

This new degree program is open to students entering as freshman in the Fall of 2006 and later.

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem for Eng	3	Biol Engr ¹	3	OChem 1	4	OChem 2	4
Chem Lab Engrs	2	Physics 1	4	OChem Lab 1	1	OChem Lab 2	1
Computing	3	Intro ChE	1	Physics 2	4	PChem Engr	3
H&SS	3	H&SS	3	Physics Lab	1	ChE Fluids	3
				MatEnBal	3	H&SS	3
Total	15	Total	15	Total	17	Total	18
Junior Fall		Junior Spring		Senior Fall		Senior Spring	
ChE Thermo	3	Biokinetics	3	CBEN Lab 2	2	Design Proj	2
AppData	3	ChE Lab 1	2	Sr. Seminar	1	Control	4
ChE Heat Tfr	3	Biochem ³	3	Design	3	Focus Tech ⁴	3
Elective	4	Separations/MT	3	Bioseparations	3	Tech Elective	3
WRTG ²	3	Biomaterials ⁴	3	Tech Elective	3	H&SS	3
		H&SS	3	Tech Elective	3		
Total	16	Total	17	Total	15	Total	15

Total Credit Hours: 128

¹Alternates are MCDB 1150 or EBIO 1210 and 1220

²Alternates are HUEN 3100, WRTG 3035, or GEEN 3000

³Alternate is CHEM 4711

⁴These courses will be taught in alternating years and should be taken in the junior or senior year as available

The table on the following page provides the complete course numbers and titles for the short-hand notation used in the chart above.

FOCUS Tech

One required out of: CHEN 4801 – Pharmaceutical Biotechnology
 CHEN 4803 – Metabolic Engineering
 CHEN 4838 – Tissue Engineering/Biomedical Devices

Recommended Tech Electives:

Biofuels Focus	Tissue Engineering Focus	Pharm. Biotechnology Focus
MCDB 2150 Genetics	IPHY 3410 Human Anatomy	CHEM 4731 Biochem 2
CHEN 4838 Energy Fund.	IPHY 3430 Human Physiology	IPHY 3410 Human Anatomy
MCEN 4162 Energy Conv.	MCDB 2150 Genetics	MCDB 2150 Genetics
CHEM 4621 Genome Datab.	MCDB 4615 Biol. Stem Cells	CHEM 4791 Bioorg. Chem.
IPHY 4200 Physiological Genetics and Genomics	CHEM 4731 Biochem 2	CHEM 5341 Chemical Biology and Drug. Design
CHEN 3000+ Ind. Study	CHEN 3000+ Ind. Study	CHEN 3000+ Ind. Study

Course Notation	Course Number	Credit Hours	Title
App Data	CHEN 3010	3	Applied Data Analysis
Biochem	CHEM 4611	3	Survey of Biochemistry
Biokinetics	CHEN 4830	3	Biokinetics
Biol Engr	CHEN 2810	3	Biology for Engineers
Biomaterials	CHEN 4805	3	Biomaterials
Bioseparations	CHEN 4820	3	Bioseparations
Calc 1	APPM 1350	4	Calculus 1 for Engineers
Calc 2	APPM 1360	4	Calculus 2 for Engineers
Calc 3	APPM 2350	4	Calculus 3 for Engineers
CBEN Lab 2	CHEN 4810	2	Chemical and Biological Engineering Laboratory 2
ChE Lab 1	CHEN 3130	2	Chemical Engineering Laboratory 1
ChE Fluids	CHEN 3200	3	Chemical Engineering Fluid Mechanics
ChE Heat Tfr	CHEN 3210	3	Chemical Engineering Heat Transfer
ChE Thermo	CHEN 3320	3	Chemical Engineering Thermodynamics
Chem for Engr	CHEN 1211	3	General Chemistry for Engineers
Chem Lab Engr	CHEM 1221	2	General Chemistry Laboratory for Engineers
Computing	GEEN 1300	3	Introduction to Engineering Computing
Control	CHEN 4570	4	Instrumentation and Process Control
Design	CHEN 4520	3	Chemical Process Synthesis
Design Proj	CHEN 4530	2	Chemical Engineering Design Project
Genetics	MCDB 2150	3	Principles of Genetics
Genetics Lab	MCDB 2151	1	Principles of Genetics Laboratory
H&SS	various	≈3	Humanities and Social Science course see H&SS section of this Guide
IntroChE	CHEN 1300	1	Introduction to Chemical Engineering
LinAlgODE	APPM 2360	4	Introduction to Linear Algebra and Differential Equations
MatEnBal	CHEN 2120	3	Chemical Engineering Material and Energy Balances
OCHEM 1	CHEM 3311 CHEM 3321	4 1	Organic Chemistry 1 Laboratory in Organic Chemistry 1
OCHEM 2	CHEM 3331 CHEM 3341	4 1	Organic Chemistry 2 Laboratory in Organic Chemistry 2
PCHEM ENGR	CHEM 4521	3	Physical Chemistry for Engineers
Pharm Biotech	CHEN 4801	3	Pharmaceutical Biotechnology
Physics 1	PHYS 1110	4	General Physics 1
Physics 2	PHYS 1120	4	General Physics 2
Phys Lab	PHYS 1140	1	Experimental Physics 1
Sr Seminar	CHEN 4090	1	Chemical Engineering Undergraduate Seminar
Tech Elective	various	≈3	Technical elective course See Technical Elective section of this Guide
WRTG	WRTG 3030	3	Advanced Composition: Writing on Science and Society (H&SS credit)

Pre-Medicine Chemical and Biological Engineering Curriculum

The pre-medicine curriculum combines the requirements for the Bachelor of Science degree in Chemical and Biological Engineering with the typical requirements for admission to medical schools in the U.S.

Freshman Fall		Freshman Spring		Sophomore Fall		Sophomore Spring	
Calc 1	4	Calc 2	4	Calc 3	4	LinAlgODE	4
Chem Engrs	3	Chem 2	5	OChem 1	4	OChem 2	4
Chem Lab Engrs	2	Phys 1	4	Organic Lab 1	1	OChem Lab 2	1
Computing	3	Intro ChE	1	Phys 2	4	PChem Engr	3
Intro MCDB ¹	3	Lit Elective	3	Phys Lab	1	ChE Fluids	3
Intro MCDB Lab ^{1,5}	1			MatEnBal	3		
	—		—		—		—
Total	16	Total	17	Total	17	Total	15
Junior Fall		Junior Spring		Senior Fall		Senior Spring ³	
Thermo	3	Biokinetics	3	CBEN Lab 2	2	Design Proj	2
Appl Data	3	ChE Lab 1	2	Sr Seminar	1	Control	4
ChE Heat Tfr	3	Biochem	3	Design	3	Focus Tech	3
Genetics ⁵	3	Separations/MT	3	Bioseparations	3	H&SS	3
Genetics Lab ⁵	1	Biomaterials ³	3	Tech Elective	4	H&SS	3
WRTG ²	3	Lit Elective ⁴	3	H&SS	3		
	—		—		—		—
Total	16	Total	17	Total	16	Total	15

Total Credit Hours: 129

¹Alternates are EBIO 1210 and 1220 for MCDB 1150; EBIO 1230 and 1240 for MCDB 1151

²Alternates are HUEN 3100, HUEN 3200 or GEEN 3000

³These courses will be taught in alternating years and should be taken in the junior or senior year, as available

⁴ENGL 1500 is a common choice - there are others

⁵Counts as technical elective

FOCUS Tech

One required out of: CHEN 4801 - Pharmaceutical Biotechnology
 CHEN 4803 - Metabolic Engineering
 CHEN 4838 - Tissue Engineering/Biomedical Devices

Recommended Tech Electives: IPHY 3410 - Introduction to Human Anatomy
 IPHY 3430 - Introduction to Human Physiology

Course Notation	Course Number	Credit Hours	Title
Intro MCDB	MCDB 1150	3	Introduction to Cellular and Molecular Biology
Intro MCDB Lab	MCDB 1151	1	Introduction to Cellular and Molecular Biology Lab

The Cooperative Education Program for Chemical and Biological Engineering

The Cooperative Education Program (Co-op Program) alternates academic terms with co-op work terms to provide students with real professional experience while completing the course requirements for the chemical and biological engineering undergraduate degree. Co-op has been termed "the ultimate scholarship" because students can earn up to \$3200/month while on work terms. The co-op coordinator will work with co-op students to determine a schedule of courses and work assignments (two examples shown below) that will allow them to finish all course and co-op requirements in five years. Besides the standard curriculum shown below, students may follow the curriculum plans for one of the specialty options. Students may participate in the Co-op Program after successfully completing CHEN 2120, Material and Energy Balances, in their second (sophomore) year. 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 of \$650 for each work session through the College of Continuing Education. Up to 24 additional credit hours are required to complete the Co-op Program. The co-op student performs his or her duties off campus at a co-op employer's place of business. At least three co-op assignments (preferably with the same employer) must be completed to earn a Certificate of Cooperative Education upon graduation.

Year	1st			2 nd			3rd			4th			5th	
Example Schedules	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring
Schedule A			INT		1		2		3			INT		
Schedule B			INT			1		2		3		INT		

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INT	Optional Internship		Academic Session		Co-op Work Session
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Cooperative Education Program Curriculum Schedule A & B

First Year Fall	First Year Spring	First Year Summer
Calc 1 4	Calc 2 4	Summer Internship (Optional)
Chem Eng 5	Biol Engr ¹ 3	
Computing 3	Phys 1 4	
H&SS 3	Intro ChE 1	
	H&SS 3	
Total 15	Total 15	

Second Year Fall A & B	Second Year Spring A	Second Year Spring B	Second Year Summer - A	Second Year Summer - B
Calc 3 4	1 st Co-op Assignment, CHEN 3930	LinAlgODE 4	H&SS ⁴ 3	1 st Co-op Assignment, CHEN 3930
OChem 1 4		ChE Fluids 3	H&SS ⁴ 3	
OChem Lab 1		PChem Engr 3		
Phys 2 4		OChem 2 4		
Phys Lab 1		OChem Lab 1		
MatEnBal ³ 3				
Total 17		Total 15	Total 6	

Third Year Fall A	Third Year Fall B	Third Year Spring A	Third Year Spring B	Third Year Summer A & B
2 nd Co-op Assignment, CHEN 3930	AppData 3	LinAlgODE 4	2 nd Co-op Assignment, CHEN 3930	A - 3 rd Co-op Assignment, CHEN 3930
	ChE Heat Tfr 3	OChem 2 4		B - Courses
	ChE Thermo 3	OChem Lab 1		
	Elective 4	PChem Engr 3		
	WRTG ² 3	ChE Fluids 3		
	—	—		H&SS ⁴ 3
	—	—		H&SS ⁴ 3
	Total 16	Total 15		Total 6

Fourth Year Fall A	Fourth Year Fall B	Fourth Year Spring A	Fourth Year Spring B	Fourth Year Summer A & B
AppData 3	3 rd Co-op Assign- ment, CHEN 3930	ChE Lab 1 2	ChE Lab 1 2	4 th Co-op Assignment, CHEN 3930
ChE Heat Tfr 3		Biokinetics 3	Biokinetics 3	
ChE Thermo 3		Sep/MT 3	Sep/MT 3	
Elective 4		Biochem ⁵ 3	Biochem ⁵ 3	
WRTG ² 3		Biomatls ⁶ 3	Biomatls ⁶ 3	
	—	—	—	
Total 16		Total 14	Total 14	

Fifth Year Fall A & B		Fifth Year Spring A & B	
Design 3		Design Proj 2	
ChBE Lab 2 2		Control 4	
Biosep 3		Tech Elec 3	
Sr Seminar 1		Focus Tech ⁶	
Tech Elective 3		3	
Tech Elective 3		H&SS 3	
	—		—
Total 15		Total 15	

¹ Alternates are MCDB 1150 or EBIO 1210 and 1220

² Alternates are HUEN 3100, WRTG 3035, or GEEN 3000

³ All students must successfully complete this course to participate in the Co-op Program.

⁴ Suggested summer courses. Students can also complete required courses offered in the summer. Some alternatives include Organic Chemistry 2 and Physical Chemistry 1, which usually are offered in complementary summer sessions.

⁵ Alternate is CHEM 4611

⁶ These courses will be taught in alternating years and should be taken in the junior or senior year as available

Curriculum and Graduation Requirements

The Standard Chemical Engineering Curriculum requires a minimum total of 128 semester credit hours of courses applicable to the degree. These credit hours are broken down as follows:

<u>Category</u>	<u>Credit Hours</u>
Required technical courses	88
Humanities and social science courses	18
Technical and chemistry elective courses	18
Free elective courses	4

A further breakdown of the required technical courses is

Mathematics and Computing	19
Chemistry and Biology	21
Physics	9
Chemical Engineering	39

The standard curriculum plan shows the technical and free elective courses distributed throughout the semesters: 7 credit hours in the junior year, and 12 credit hours in the senior year. In addition to the 18 credit hours of chemistry courses, there is a 3 credit-hour advanced chemistry elective, usually taken in the junior year.

The Standard Chemical and Biological Engineering Curriculum requires a minimum total of 128 semester credit hours of courses applicable to the degree. These credit hours are broken down as follows:

<u>Category</u>	<u>Credit Hours</u>
Required technical courses	94
H&SS courses	18
Technical elective courses	12
Free elective courses	4

A further breakdown of the required technical courses is:

Mathematics & Computing	19
Chemistry	21
Biology	3
Physics	9
Chemical & Biological Engineering	42

The required courses shown above include *Introduction to Chemical Engineering* (CHEN 1300, 1 credit hour) taken by all Chemical Engineering and Chemical and Biological Engineering majors in their freshman year and by other students considering Chemical or Chemical and Biological Engineering as a major. For students who become Chemical or Chemical and Biological Engineering majors in their sophomore year or later, this course is not required and may be replaced by an additional credit hour of technical elective. Therefore, for most Chemical Engineering transfer students, required technical courses total 87 credit hours and technical elective courses sum to 16. For most Chemical and Biological Engineering transfer students, required courses total 96 and technical elective courses sum to 10.

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.

The curriculum options (Computer, Environmental, Materials, Microelectronics, and Bioengineering) and the Pre-Medicine Curriculum specify most or all of the technical and free electives, which may rearrange the order in which courses are taken, and may substitute specialized courses in the required category. The requirements of the technical elective, free elective, and humanities & social science categories are presented in the following two sections of this Guide.

Graduation Requirements

To receive a Bachelor of Science degree in Chemical Engineering or Chemical and Biological Engineering from the University of Colorado, you must complete one of the curricula published in this Guide, comprising a minimum of 128 semester credit hours, and your CU cumulative grade-point average (GPA) must be 2.00 or greater. You must also achieve a grade of C- or better in all CHEN courses specifically required for graduation and your GPA in CHEN courses must be 2.00 or greater.

The Department recommends that all graduating seniors take the FE (Fundamentals of Engineering) or GRE exam. The Department will pay one third of the cost of the FE exam.

Technical and Free Elective Requirements

Beyond the Standard Chemical Engineering Curriculum, students must take an additional 16 credit hours of technical elective courses and 4 credits of free electives. If the one-credit Intro to Chemical Engineering (CHEN 1300) course is taken, only 15 credits of technical electives are required. The Chemical and Biological Engineering curriculum has 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, technical elective and/or free elective courses have already been “chosen” for you. For example, in the Energy Option, GEOL 1010 is required for the option and this counts as a technical elective. Please consult your advisor or the curriculum flowchart sheets at the end of the Help Guide for more guidance related to this. 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. The list of approved technical electives is available at www.colorado.edu/undergrad/guide.html.
2. A minimum of 16 semester credit hours of approved technical elective courses must be completed successfully for a Chemical Engineering degree or 13 semester credit hours for a Chemical and Biological Engineering degree.
3. Six (6) of these credit hours must be chemical engineering courses (CHEN) numbered 3000 or above for the Standard Chemical Engineering degree. Three (3) of the 13 semester credit hours required for the Chemical and Biological Engineering degree must be met by a focus technical elective listed under the Standard Chemical and Biological Engineering Curriculum.
4. Any deviations from requirements 1. and 2. above 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. Look for notices of independent study opportunities, or express your interest to a faculty member.

Free Electives

Free elective courses may be chosen from either the technical category or the humanities & 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 free electives are not *completely free*. For example, credit hours in pre-calculus mathematics, preparatory chemistry, and preparatory physics, required by the University's Minimum Academic Preparation Standards (MAPS) policy, may not 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 on Page 40.

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 rather than merely a requirement to be fulfilled. 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. We discourage you from selecting a random collection of introductory-level courses and likewise encourage you to plan and take a challenging, and thereby rewarding, H&SS program.

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.

The Humanities and Social Science requirements are as follows:

1. An undergraduate degree program in the College of Engineering and Applied Science requires a minimum of fifteen (15) semester hours taken as approved courses in the humanities and social sciences.
2. Courses representing at least six (6) semester hours must be taken at the 3000 level or above.
3. In addition to these 15 credit hours, an upper division writing course is required of all students.
 - a. Approved courses include WRTG 3030, WRTG 3035, GEEN 3000, and HUEN 3100.
 - b. Any other writing courses must be approved by the Undergraduate Education Council.
4. Any other purposeful grouping of H&SS courses can be approved for an individual student by the H&SS Subcommittee of the Undergraduate Education Council.

Depending upon when you entered the College of Engineering, your H&SS requirements will be slightly different:

- A. If you entered prior to the Fall of 2006, you can find your H&SS requirements at the old HOMER website (<http://engineering.colorado.edu/homer/Prefall2007.htm>).
- B. If you entered either in the Fall of 2006 OR Spring of 2007, you can complete either (but not a combination of the two) the old requirements above (<http://engineering.colorado.edu/homer/Fall2007.htm>) or the new requirements (below in part C).

Note: Beginning in the Fall of 2007 the H&SS requirements changed FROM 12 lower level and 6 upper level (3 of these upper division had to be the WRTG 3030 course) credits TO 9 lower level and 9 upper level (3 of which have to be the WRTG 3030 class) credits. If you began before Fall 2007 and you choose to use the OLD H&SS requirements (12 lower level, 6 upper level), then you must consult the old HOMER course listings (<http://engineering.colorado.edu/homer/Prefall2007.htm>) for suitable courses; this old HOMER list will be used to evaluate the credibility of your H&SS courses.

- C. If you entered in the Fall of 2007 or later, then you can find a list of H&SS courses at www.engineering.colorado.edu/odyssey.

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 the 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 a moderated discussion in a group setting, generally 12 students and a faculty moderator. Frequent writing assignments help the students learn to write lucidly and to find in good writing the expression of intellectual discipline. 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 the students. Instead, all participants share in a discussion 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 develops skills of unquestionable practical value: speaking, writing, thinking critically. These skills carry far beyond the study of the humanities.

Students 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.

Independent Study and Research Opportunities

The Department of Chemical and Biological Engineering has active research programs in biotechnology and bioengineering, catalysis, chemical reaction engineering, environmental chemical engineering, fluid mechanics and transport phenomena, low-gravity science and space applications, polymers and materials science and engineering, membranes and separations, process modeling, control and optimization, and thermodynamics. 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 is to enroll in an independent study project under the supervision of one of our faculty. As a general rule of thumb, a three-credit-hour independent study project will require 9 hours of research work per week. The independent study project course counts as a technical elective. A second mechanism 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 have research grants specifically designed to support undergraduate students, such as those provided by the National Science Foundation's Research Experience for Undergraduates Program. Students may also find a research position through application to the College of Engineering's Discovery Learning Apprenticeship Program. Finally, students may apply for financial assistance through CU's Undergraduate Research Opportunities Program (UROP) or the Undergraduate Research Assistantships Program of the Biological Sciences Initiative (BSI). The UROP office is located in Norlin S430, and their phone is 2-2596. The BSI office is in IBS 5, and the phone is 2-8230.

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 education 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. Senior Thesis applications can be obtained in the ChBE office (ECCH 111).

Concurrent BS and MS Degree Program in Engineering

Students with strong academic records who plan to pursue advanced degrees through graduate study may find it advantageous to apply for admission to the concurrent BS/MS degree program. Students plan a graduate program beginning in their junior year. The plan provides a small tuition discount for the MS degree and, in Chemical and Biological Engineering, we allow up to 6 credit hours of graduate work to be applied to the BS degree. This program also provides opportunities to work with faculty on independent study or research projects.

Application is made to the Graduate School through the Department. Application and admission may occur during the junior year. The Department requires the following items for admission to this program:

Minimum requirements for the program:

- Completion of the five CHEN core courses with a minimum grade of B- in each course: CHEN 2120, CHEN 3200, CHEN 3210, CHEN 3320, CHEN 3010
- A minimum overall GPA of 3.25
- A minimum GPA of 3.0 in all CHEN course work
- Completion of MAPS requirement
- GRE required

The application process:

- Complete the BS/MS Degree Application during your junior year:
Deadlines for application: Fall admission – February 1st, Spring admission – October 1st
- A one-page statement of purpose describing briefly your past work in the field, including noncourse educational experiences, teaching, or other relevant employment, publication, theses, research in progress, other scholarly activities, and your plans for graduate study and a professional career
- Complete the Concurrent Degree Application (available on the departmental website)
- Provide an unofficial transcript

Requirements for the two degrees are the same as those for two degrees taken separately: 128 credit hours for the BS degree and 24-30 hours including thesis (Plan I) or 30 credit hours (Plan II) for the MS degree.

All students choose or are assigned a faculty advisor to help them develop a program of study best suited to their interests. Students are encouraged to pursue independent study on research programs or in areas of specialization beyond those offered in formal courses. Students are allowed to structure their senior and graduate years in an order that is optimal for their program, as long as all requirements for both the BS and MS degrees are completed by the end of the concurrent BS/MS program. The BS and MS degrees must be awarded concurrently at the completion of both degree programs.

A minimum GPA of 3.00 must be maintained for continuation in the program; if the GPA falls below 3.00, all hours completed with a passing grade while in the program count only towards fulfillment of the BS degree.

Tuition rates for resident students in this program are usually at the undergraduate rate through the completion of their unmet requirements for the BS and MS degrees are completed. For additional details on this program, contact our Concurrent BS and MS advisor, Professor Stephanie Bryant.

Special Programs of Interest

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. They can provide a tremendous broadening experience.

Chemical engineering and chemical and biological engineering students participate in two categories of study abroad programs. The first 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, for more information or visit their website at www.colorado.edu/OIE/Studyabroad. Students planning to study abroad should conduct an advising meeting with David Clough 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 B.S. 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.

There are several academic programs on the Boulder Campus that offer undergraduate minors. It is possible for you to complete a minor in another program by satisfying its requirements. This will not appear on your CU diploma, but it will be noted on your official transcript. Current minors offered, as listed in the 2007-2008 CU catalog, are:

applied mathematics; astrophysical and planetary sciences; atmospheric and oceanic sciences; chemistry and biochemistry; Chinese; classics; dance; ecology and evolutionary biology; economics; ethnic studies; French; geography; geological sciences; Germanic studies; history; Italian; Japanese; linguistics; mathematics; philosophy; physics; political science; religious studies; Russian studies; Scandinavian studies; theater; women's studies; business; and computer science.

You should consult with Professor Sani if you plan to complete a second degree or minor.

IB/AP Mapping

AP Exam	Exam Score	CU-Boulder Course Equivalent	Credit Hours	Chemical Engineering credit
Biology:	5, 4	EPOB 1210, 1220, 1230, and 1240	8	3 hrs for Biology for Engineers; 5 hrs free electives
Chemistry:	5	CHEM 1111 and 1131	10	5 hrs CHEN 1211/1221; 5 hrs free electives
	4	CHEM 1111	5	5 hrs CHEM 1111; must take either CHEM 1131 or CHEN 1211/1221
Latin-Virgil	5	CLAS 2114, 2124, and 3024	11	4 hrs LD humanities; rest free electives
	4	CLAS 2114 and 2124	8	4 hrs LD humanities; rest free electives
	3	CLAS 2114	4	4 hrs LD humanities
Latin-Literature	5	CLAS 2114, 2124, and 3024	11	4 hrs LD humanities; rest free electives
	4	CLAS 2114 and 3024	8	4 hrs LD humanities; rest free electives
	3	CLAS 2114	4	4 hrs LD humanities
Computer Science A	5	CSCI 1300	4	free elective only
	4	CSCI 1200	4	free elective only
Computer Science AB	5	CSCI 1300 and 2270	8	4 hrs technical elective; 4 hrs free elective
	4	CSCI 1300	4	free elective only
	3	CSCI 1200	4	free elective only
Economics: Micro	5, 4	ECON 2010	4	4 hrs LD humanities
Economics: Macro	5, 4	ECON 2020	4	4 hrs LD humanities
English Literature and Composition	5, 4	ENGL 1500 and 2502	6	3 hrs LD humanities; rest free electives
	3	ENGL 1500	3	3 hrs LD humanities
English Language and Composition	5	WR TG 1150 and 1250	6	free elective only
	4	WR TG 1150	3	free elective only
Environmental Science:	5, 4	ENVS 1000	4	free elective only
Studio-Drawing Portfolio or Studio- General Portfolio	5, 4	ARTS 1012	3	free elective only
Art History	5, 4	ARTH 1300 and 1400	6	6 hrs LD humanities
French Language	5	FREN 2110, 2120, and 2500	9	3 hrs LD humanities; rest free electives
	4	FREN 2110 and 2120	6	3 hrs LD humanities; rest free electives

AP Exam	Exam Score	CU-Boulder Course Equivalent	Credit Hours	Chemical Engineering credit
	3	FREN 2110	3	3 hrs LD humanities
French Literature	5, 4	FREN 3110 and 3120	6	free electives only
	3	FREN 3120	3	free electives only
German Language	5	GRMN 2020 and 3010	7	free elective only
	4	GRMN 2010 and 2020	8	4 hrs LD humanities; rest free electives
	3	GRMN 2010	4	4 hrs LD humanities
Italian Language and Culture	5	ITAL 1020, 2110, and 2120	11	8 hrs LD humanities; rest free electives
	4	ITAL 10200 and 2110	8	8 hrs LD humanities; rest free electives
	3	ITAL 1020	5	5 hrs LD humanities
Spanish Language(f)	5	SPAN 2110, 2120, and 3000	11	8 hrs LD humanities; 3 hrs UD humanities
	4	SPAN 2110 and 2120	6	6 hrs LD humanities
	3	SPAN 2110	3	3 hrs LD humanities
Spanish Literature(f)	5	SPAN 3340 and 3700	6	free electives only
	4	SPAN 3700	3	free electives only
Human Geography	5, 4, 3	GEOG 1992	3	3 hrs LD humanities
Comparative	5, 4	PSCI 2012	3	3 hrs LD humanities
United States	5, 4	PSCI 1101	3	3 hrs LD humanities
U.S. History	5, 4	HIST 1015 and 1025	6	6 hrs LD humanities
European History	5, 4	HIST 1010 and 1020	6	6 hrs LD humanities
World History	5, 4	Determined by department (g)	3	free elective only
Math-Calculus AB	5, 4	MATH 1300 or APPM 1350 (Engineering)	5	APPM 1350 (4 hrs)
			4	
Math-Calculus BC	5, 4	MATH 1300 and 2300 or APPM 1350 and 1360 (engineering)	10	APPM 1350 and 1360 (8 hrs)
			8	
Math-Calculus BC and AB subscore	3 /5,4,3	MATH 1300 or APPM 1350 (engineering)	5	APPM 1350 (4 hrs)
			4	
Math-Calculus BC and AB subscore	2,1/5,4	Math 1300 or APPM 1350 (engineering)	5	
			4	
Statistics	5, 4	MATH 2510	3	free elective only
Music Listening and Literature	5	EMUS 1832 and 2752	6	6 hrs LD humanities
	4, 3	EMUS 1832	3	3 hrs LD humanities

AP Exam	Exam Score	CU-Boulder Course Equivalent	Credit Hours	Chemical Engineering credit
Music Theory	5	MUSC 1101, 1111, 1121, and 1131	6	free elective only
	4, 3	MUSC 1101 and 1121	3	free elective only
Physics B	5, 4	PHYS 2010	5	free elective only
Physics C-Mechanics	5, 4	PHYS 1110	4	PHYS 1110 (4 hrs)
Physics C-Electricity and Magnetism	5, 4	PHYS 1120	4	PHYS 1120 (4 hrs)
Psychology	5, 4	PSYC 1001	4	4 hrs LD humanities

IB Subject Examination	Level of Examination	Examination Score	CU-Boulder Course Equivalent*	Chemical Engineering credit
Anthropology	Higher	4	ANTH 2100 and 3 lower-division credits meeting cultural and gender diversity core requirement	free elective only
Art	Higher	4	Elective credits (consult faculty with portfolio for further consideration of fine arts course equivalents)	6 free elective hours
Biology	Higher	4	EPOB 1210, 1220, 1230, and 1240	3 hrs for Biology for Engineers; 5 hrs free electives
Business Management	Higher	4	BCOR 1100 and BCOR 2 (lower-division business core)	3 hrs technical electives; 3 hrs free electives
Chemistry	Higher	5	CHEM 1111 and 1131	5 hrs CHEN 1211/1221; 5 hrs free electives
	Higher	4	CHEM 1111	5 hrs CHEM 1111; must take either CHEM 1131 or CHEN 1211/1221
Computer Science	Higher	4	CSCI 1200	free electives only
Design Technology	Higher	4	Elective credits	free electives only
Economics	Higher	4	ECON 1000	4 hrs LD humanities
English (A-1)	Higher	4	ENGL 2502 and 3 lower-division credits meeting literature and the arts core requirement	free electives only

IB Subject Examination	Level of Examination	Examination Score	CU-Boulder Course Equivalent*	Chemical Engineering credit
English (A-2)	Higher	4	ENGL 1500 and 3 lower-division credits meeting literature and the arts core requirement	3 hrs LD humanities; rest free electives
French (A-1)	Higher	4	FREN 3050 and 3100	3 hrs UD humanities; 3 hrs free electives
French (A-1)	Standard	4	FREN 1010 and 1020	6 hrs LD humanities
French (A-2)	Higher	4	FREN 2500, 3050, and 3100	3 hrs UD humanities; 6 hrs free electives
	Standard	4	FREN 2120 and 2500	free electives only
French AB Initio	Higher	7	FREN 1050	free electives only
		6, 5	FREN1010	5 hrs LD humanities
French (B)	Higher	7, 6	FREN 2110, 2120, and 3050	3 hrs UD humanities; 6 hrs free electives
	Higher	5,4	FREN 2110 and 2120	3 hrs UD humanities; 3 hrs free electives
	Standard	4	FREN 1010 and 1020	10 hrs LD humanities
Geography	Higher	4	GEOG 1982 and 1992	3 hrs LD humanities; rest free electives
German (B)	Higher	6, 7	GRMN 2020 and 3010	free electives only
German (B)	Higher	5, 4	GRMN 2010 and 2020	4 hrs LD humanities; rest free electives
German (B)	Standard	4	GRMN 1010 and 1020	8 hrs LD humanities
History of Africa	Higher	4	HIST 1208	3 hrs LD humanities
History of Europe	Higher	4	HIST 1010 and 1020 (meets historical context core requirement)	6 hrs LD humanities
History of the Americas	Higher	4	HIST 1025 and 1038 (meets U.S. context and historical context core requirements)	6 hrs LD humanities
History (Other)	Higher	4	One of HIST 1038, 1208, 1308, 1408, 1608, or 1708	3 hrs LD humanities
Latin	Higher	4	Waives MAPS foreign language requirement	—
Mathematics	Higher and Further	5	MATH 1300 and 2300	APPM 1350 and 1360 (8 hrs)

IB Subject Examination	Level of Examination	Examination Score	CU-Boulder Course Equivalent	Chemical Engineering credit
Mathematics	Higher	5	MATH 1050, 1070, 1300 and 1 general math credit	APPM 1350 (4 hrs) rest free electives
	Higher	4	General lower-division credits applied to quantitative reasoning and mathematical skills core requirement	free electives only
Music	Higher	4	Elective credits	free electives only
Philosophy	Higher	4	PHIL 1000 (meets ideals and values core requirement) and 3 lower-division credits	3 hrs UD humanities; 3 hrs free electives
Physics	Higher	4	PHYS 2010 and 2020	free electives only
Psychology	Higher	4	PSYC 1001 and 2 lower-division credits	4 hrs LD humanities; rest free electives
Russian (B)	Higher	4	RUSS 2010 and 2020	8 hrs LD humanities
	Standard	5	RUSS 2010 and 2020	8 hrs LD humanities
Spanish (A-1)	Higher	4	SPAN 3000 and 3100	8 hrs UD Humanities
Spanish (A-2)	Higher	7, 6	SPAN 2110, 2120, and 3000	6 hrs LD humanities; 5 hrs UD humanities
		5, 4	SPAN 2110 and 2120	6 hrs LD humanities
	Higher	7, 6	SPAN 1020 and 2110	8 hrs LD humanities
Spanish (B)	Higher	7, 6	SPAN 2110, 2120, and 3000	6 hrs LD humanities; 5 hrs UD humanities
	Higher	5,4	SPAN 2110 and 2120	6 hrs LD humanities
	Standard	4	SPAN 1010 and 1020	10 hrs LD humanities
Spanish (AB)	Standard	7, 6	SPAN 1010	5 hrs LD humanities
Theatre	Higher	4	Elective credits (consult faculty for further consideration of theatre course equivalents)	free electives only

Common Advising Questions and Some Answers

(The answers to many more FAQs can be found at <http://cbenadvising.pbwiki.com>)

Certain questions arise frequently in advising sessions between students and faculty or staff advisors. We have assembled some of them here and attempted to provide answers. We encourage you to help us improve this section of this Guide by suggesting new questions or criticizing the explanations already provided here.

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 "good ol' Moo U" 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. You may consult with the Program for Writing and Rhetoric if you have further questions about this.

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 1111 and CHEM 1131, 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. 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 a free elective. 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.

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 General Chemistry 2 (CHEM 1131) at some point during your undergraduate program. You will not be allowed to take General Chemistry 1 (CHEM 1111) as an engineering student. You must take Chemistry for Engineers (CHEN 1211/CHEM 1221) as your first general chemistry course. It may be of interest to you that General Chemistry 2 (CHEM 1131) is offered in the Summer term, in addition to the Fall and Spring semesters.

Q: Are the prerequisites enforced for all courses?

A: Perhaps not, but the Department of Chemical and Biological Engineering will enforce prerequisites for all CHEN courses. You are advised strongly not to take courses whose prerequisites you have not satisfied. If you do not satisfy a prerequisite, you must petition to stay in the course.

Q: How do I fill out a petition?

A: You can find the petition form in the ChBE main office, ECCH 111. This form will ask you to describe what you are petitioning and to justify your reason to petition. You MUST be thorough and supply sufficient reasoning for your petition. Please read the following guidelines regarding petitioning:

1. For any petition submitted to the department for a variance on course requirements, the petitioner must provide a clear justification for the variance. Justifications that are not acceptable include : (1) It will delay my graduation if not granted; (2) my advisor told me to submit the petition.
2. Instructors for the course that a petition is being submitted for cannot sign the petition form, nor can they approve a petition. The petition must be turned in to the front office and a department committee will evaluate the petition.
3. A petition must be submitted in a timely manner. If a petition is submitted a week after classes start for a variance in a course for that semester, there may not be enough time for the committee to make a decision before the drop/add date.

Q: How do I determine what the prerequisites are for a course?

A: The Boulder Campus CU catalog lists prerequisites with the course descriptions. The on-line Registration Handbook published each semester may or may not list prerequisites. The curriculum checklist form at the back of this Guide shows prerequisites for the required courses of the curriculum. The Department also maintains a Learning Goals sheet for each CHEN course that includes a description of prerequisites.

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.

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 2.00 or greater. Any class required for graduation (even CHEN technical electives) must be passed with a grade of C- or better. In addition, any substitute courses for typical CHEN courses (e.g., MCEN 3021 in lieu of CHEN 3200 or MCEN 3022 in lieu of CHEN

3210) must also be passed with grades of C- or better.

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) next fall. Also, CHEN 3200 (Fluids) may be offered in the Summer semester. Consult an advisor.

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 ChE 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. They are actually graduation requirements (yes, requirements upon graduation from CU). 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.

MAPS requirements are different for the various colleges at CU. For example, Arts and Sciences requires one high school unit of geography and Engineering does not. See page 8 of the 2007-2008 CU Catalog.

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 2.00. You may do this by taking summer term courses or correspondence courses only.

Q: Should I consider taking one of the curricular options? They really limit my elective choices.

A: You should decide to take one of the options if you want to specialize in the theme of that option. The options do specify most or all of your technical electives in a way designed to provide that specialization. If you complete one of the options, the Department will provide you with a certificate at the time of your graduation. On the other hand, you should not feel pressured to take one of the options if it doesn't fit your interests.

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 to bail out of a couple courses. What do I do?

A: After the six-week drop deadline, it is difficult to bail out of courses. When you enroll in courses at the beginning of the semester, you make a commitment to complete them. You have the first six weeks of the semester to make decisions about dropping courses. After that, 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. You may also consider withdrawing from the semester if your personal situation is most severe. Starting in Fall 2006, the Boulder Campus has made the forgiveness program permanent, under the title "course repetition program." This program will allow students to repeat up to 10 credit

hours of course work with the first grade in the same course not calculated into the CU grade point average or the total credit hour calculations. The exact same course must be repeated on the Boulder Campus. Meet with the Dean's Office staff for additional details on this experimental program.

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. Help!

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. If you are female, you may wish to contact the Women In Engineering Program. If you are an ethnic minority student, you might want to contact the MEP Program. These are not matters to be taken lightly and good communication is most important.

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 electives and electives specified for the options may not be taken Pass-Fail.

Other Advising Resources

You may find the following resources useful in answering advising questions. In print form, you should have copies of

- Boulder Campus University of Colorado Catalog for the current year
- On-line Registration Handbook for the current and next semester
- College of Engineering Advising Sheets
(available in the foyer of the Engineering Center)
- Boulder Campus Student Handbook

You should be familiar with the use of the CU's information system on the CU-Boulder web-site, <http://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

- Humanities and Social Science electives
Advising Guide
ecadw.colorado.edu/engineering/Advising-Guides/HSS.pdf
- 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

Boulder Campus Resources

- General Boulder Campus Advising
Student Academic Services Center, Willard 386, 2-1416
- Professional Counseling on Personal Matters
Counseling and Psychological Services, Willard 134, 2-6766
- Career Counseling
Career Services, Willard 34, 2-6541
- Medical Consultation, including psychiatric
Wardenburg Health Center, 2-5101
- Financial Aid Issues
Office of Financial Aid, Regent 175, 2-5091
- Preprofessional Advising Center
Old Main 1B-90, 5-3000

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. If you are interested in any of these groups, call their office and watch for meeting notices posted on various bulletin boards in the Engineering Center.

American Institute of Chemical Engineers - AIChE



The society for chemical engineering students on campus is the American Institute of Chemical Engineers. The University of

Colorado student 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, usually on Thursday evenings. Meeting notices are posted around the Engineering Center and in the Department of Chemical and Biological Engineering. 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.

Biomedical Engineering Society - BMES



The University of Colorado student chapter of the Biomedical Engineering Society, while composed mainly of chemical engineering students, 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 - ΩΧΕ



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.

For further information, contact the Ω XE office, ECCR 213, 2-6528. The Chemical Engineering Department office can supply you with names and phones of this year's officers.

Tau Beta Pi - TBPI



Tau Beta Pi is the honorary society for all engineering students. Juniors in the top 1/8th 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 in TBPI and have assumed leadership positions in recent years. Strive for excellence and join TBPI! The TBPI 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.

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.

Chemical Engineering Graduation Checklist

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry	ChemE Core			
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S (alt MCDB 1150 or EBIO 1210/1230) <small><input type="checkbox"/> CHEM 3200 or MCEN 3021</small>	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S (alt. MCEN 3021) <small><input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F (alt MCEN 3022) <small><input type="checkbox"/> CHEM 3200 or MCEN 3021</small>	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEM 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEN 1211 <input type="checkbox"/> APPM 2350</small>	Adv. Chem El. <input type="checkbox"/> (3 cr. hr min) (prereqs vary)	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	Physics PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <small><input type="checkbox"/> APPM 1350 coreq.</small>		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEM 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	Tech Electives (Total of 16 cr hrs) Lower Level (Total of 10 cr. hrs) CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S (not req'd)		
Free Electives (4 cr. min) List: 1) 2)			H&SS (9 upper and 9 lower req'd) Lower Level List: 1) 2) 3)		
Upper Level (3000+) 1) WRTG 3030 2) 3)			Tech Elective 2: <input type="checkbox"/> Tech Elective 3: <input type="checkbox"/> Upper Level (Total of 6 CHEN 3000+ cr hrs) Tech Elective 4: <input type="checkbox"/> Tech Elective 5: <input type="checkbox"/>		

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Bioengineering Option

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry		ChemE Core		
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEN 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S (alt MCDB 1150 or EBIO 1210/1230)	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S (alt. MCEN 3021) <small><input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F (alt MCEN 3022) <small><input type="checkbox"/> CHEN 3200 or MCEN 3021</small>	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350</small>	CHEM 4611-3 <input type="checkbox"/> <i>Biochemistry</i> <small><input type="checkbox"/> CHEM 3311</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	Physics PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <small><input type="checkbox"/> APPM 1350 coreq.</small>		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	Tech Electives (Total of 16 cr hrs; 6 cr hrs must be CHEN 3000+)		
Free Electives (4 cr hr min) List: 1) 2)			CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S (not req'd)	Technical Elective <input type="checkbox"/> (3 cr hr min)	Bioscience Elective <input type="checkbox"/> (3 cr hr min)
H&SS (9 upper and 9 lower req'd) Lower Level List: 1) 2) 3)			Upper Level (3000+) 1) WRTG 3030 2) 3)	Bio Elective 1: <input type="checkbox"/> (3 cr hr min)	Bio Elective 2: <input type="checkbox"/> (3 cr hr min)
			Bio Elective 3: <input type="checkbox"/> (3 cr hr min)		

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards: (MAPS) <input type="checkbox"/> OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Computer Option

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry	ChemE Core				
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S <small>(alt MCDB 1150 or EBIO 1210/1230)</small>	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S <small>(alt. MCEN 3021) <input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>	
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> <small>(no prereqs)</small>	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F <small>(alt MCEN 3022) <input type="checkbox"/> CHEN 3200 or MCEN 3021</small>	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>	
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350</small>	Adv. Chem El. <input type="checkbox"/> (3 cr. hr min) <small>(prereqs vary)</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>	
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	Physics		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	Tech Electives (Total of 16 cr hrs)			
Option Elective			H&SS (9 upper and 9 lower req'd)			
CSCI 1300-4 <input type="checkbox"/> <i>Programming</i>	Lower Level List: 1) _____ 2) _____ 3) _____		Upper Level (3000+) 1) WRTG 3030 2) _____ 3) _____		ECEN 2120-5 <input type="checkbox"/> <i>Computers as Comp.</i> OR ECEN 3100-5 <input type="checkbox"/> <i>Digital Logic</i>	
	Upper Level (Total of 6 CHEN 3000+ cr hrs)			Tech Elective 3: <input type="checkbox"/>		Tech Elective 4: <input type="checkbox"/>

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards: (MAPS) <input type="checkbox"/> OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Energy Option Biofuels Focus

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry	ChemE Core			
GEEN 1300-3 <input type="checkbox"/> <i>no prereqs</i> <input type="checkbox"/> APPM 1350 coreq.	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <input type="checkbox"/> CHEM 1221 coreq.	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <input type="checkbox"/> CHEM 1211 coreq.	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S (alt MCDB 1150 or EBIO 1210/1230)	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S (alt. MCEN 3021) <input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <input type="checkbox"/> CHEM 1211	ICHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <input type="checkbox"/> CHEM 3311 coreq.	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F (alt MCEN 3022) <input type="checkbox"/> CHEN 3200 or MCEN 3021	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEM 3320 <input type="checkbox"/> CHEM 3210
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <input type="checkbox"/> APPM 1350	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <input type="checkbox"/> CHEM 3311/3321	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <input type="checkbox"/> CHEM 3331 coreq.	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <input type="checkbox"/> CHEM 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEM 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEM 3210	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEM 3320
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <input type="checkbox"/> APPM 1360	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350	CHEM 4611-3 <input type="checkbox"/> <i>Survey Biochemistry</i> <input type="checkbox"/> CHEM 3311	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEM 3220 <input type="checkbox"/> CHEM 4330	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEM 3320
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <input type="checkbox"/> APPM 1360	Physics		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <input type="checkbox"/> CHEM 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEM 4330	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <input type="checkbox"/> CHEM 4520	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <input type="checkbox"/> CHEM 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEM 4330
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <input type="checkbox"/> PHYS 1120 coreq.	Tech Electives (Total of 16 cr hrs)		
Free Electives			CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S (not req'd)	CHEN 4838-3 <input type="checkbox"/> <i>Energy Fundamentals</i> F	
H&SS (9 upper and 9 lower req'd)			Energy Elective 1: <input type="checkbox"/> (3 cr hr min)	Energy Elective 2: <input type="checkbox"/> (3 cr hr min)	
ENVS 3070-3 <input type="checkbox"/> OR PHYS 3070-3 <input type="checkbox"/> <i>En. and Environment</i> (1 cr min) (Genetics Lab counts as remaining free elective)	Lower Level List: 1) _____ 2) _____ 3) _____	Upper Level (3000+) 1) WRTG 3030 2) _____ 3) _____	MCDB 2150-3 <input type="checkbox"/> <i>Genetics</i> and MCDB 2151-1 <input type="checkbox"/> <i>Genetics Lab</i> (note: add'l 1 cr hr applied to free elect)	Energy Elective 3: <input type="checkbox"/> CHEN 3000+ (3 cr hr min)	

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Energy Option

Fossil Fuels/Petroleum Focus

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry	ChemE Core			
GEEN 1300-3 <input type="checkbox"/> <i>no prereqs</i> <input type="checkbox"/> APPM 1350 coreq.	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <input type="checkbox"/> CHEM 1221 coreq.	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <input type="checkbox"/> CHEM 1211 coreq.	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S (alt MCDB 1150 or EBIO 1210/1230)	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S (alt. MCEN 3021) <input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <input type="checkbox"/> CHEM 1211	ICHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <input type="checkbox"/> CHEM 3311 coreq.	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F (alt MCEN 3022) <input type="checkbox"/> CHEM 3200 or MCEN 3021	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <input type="checkbox"/> CHEM 2120 <input type="checkbox"/> CHEM 4511 or 4521	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <input type="checkbox"/> CHEM 3200 <input type="checkbox"/> CHEM 3320 <input type="checkbox"/> CHEM 3210
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <input type="checkbox"/> APPM 1350	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <input type="checkbox"/> CHEM 3311/3321	ICHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <input type="checkbox"/> CHEM 3331 coreq.	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <input type="checkbox"/> CHEM 3010 <input type="checkbox"/> CHEM 3200 <input type="checkbox"/> CHEM 3320 <input type="checkbox"/> CHEM 3210 or MCEN 3022	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <input type="checkbox"/> CHEM 3320 <input type="checkbox"/> CHEM 3210	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEM 3320 <hr style="border-top: 1px dashed black;"/> OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEM 3320
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <input type="checkbox"/> APPM 1360	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350	CHEM 4531-3 <input type="checkbox"/> <i>PChem 2</i> <input type="checkbox"/> PHYS 1120 <input type="checkbox"/> CHEM 4521	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <input type="checkbox"/> CHEM 3130 <input type="checkbox"/> CHEM 3220 <input type="checkbox"/> CHEM 4330	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <input type="checkbox"/> CHEM 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEM 3220 <input type="checkbox"/> CHEM 4330
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <input type="checkbox"/> APPM 1360	Physics PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <input type="checkbox"/> APPM 1350 coreq.		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <input type="checkbox"/> CHEM 3010 <input type="checkbox"/> CHEM 3220 <input type="checkbox"/> CHEM 4330	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <input type="checkbox"/> CHEM 4520	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <input type="checkbox"/> CHEM 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEM 3220 <input type="checkbox"/> CHEM 4330
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <input type="checkbox"/> PHYS 1120 coreq.	Tech Electives (Total of 16 cr hrs)		
Free Electives			CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S (not req'd)	CHEN 3000+ <input type="checkbox"/> <i>Independent Study</i> (3 cr hrs)	
H&SS (9 upper and 9 lower req'd)			GEOL 1010-3 <input type="checkbox"/> <i>Intro Geology</i>	CHEN 4838-3 <input type="checkbox"/> <i>Energy Fundamentals</i> F	
ENVS 3070-3 <input type="checkbox"/> OR PHYS 3070-3 <input type="checkbox"/> <i>En. and Environment</i> (1 cr min)	Lower Level List: 1) _____ 2) _____ 3) _____	Upper Level (3000+) 1) WRTG 3030 2) _____ 3) _____	Energy Elective 1: <input type="checkbox"/> (3 cr hr min)	Energy Elective 2: <input type="checkbox"/> (3 cr hr min)	

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Energy Option Photovoltaic Focus

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry	ChemE Core			
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S <small>(alt MCDB 1150 or EBIO 1210/1230)</small>	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S <small>(alt. MCEN 3021)</small> <small><input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> <small>(no prereqs)</small>	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	ICHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F <small>(alt MCEN 3022)</small> <small><input type="checkbox"/> CHEN 3200 or MCEN 3021</small>	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEM 3320 <input type="checkbox"/> CHEM 3210</small>
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	ICHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEM 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEM 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEM 3320</small>
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350</small>	CHEM 4011-3 <input type="checkbox"/> <i>Inorganic Chemistry</i> <small><input type="checkbox"/> CHEM 4521</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEM 3220 <input type="checkbox"/> CHEM 4330</small>	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEM 3320</small>
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	Physics PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <small><input type="checkbox"/> APPM 1350 coreq.</small>		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEM 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEM 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEM 4330</small>
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	Tech Electives (Total of 16 cr hrs)		
Free Electives			ECEN 3030-3 <input type="checkbox"/> OR MCEN 3017-3 <i>Circuits</i>	CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S <small>(not req'd)</small>	CHEN 3000+ <input type="checkbox"/> <i>Independent Study</i> <small>(3 cr hrs)</small>
ENVS 3070-3 <input type="checkbox"/> OR PHYS 3070-3 <i>En. and Environment</i> <small>(1 cr min)</small> <small>(Phys 3 Lab counts as remaining free elective)</small>	Lower Level List: 1) _____ 2) _____ 3) _____ ←	Upper Level <small>(3000+)</small> 1) WRTG 3030 2) _____ 3) _____	PHYS 2130-3 <input type="checkbox"/> <i>Physics 3</i> and PHYS 2150-1 <i>Phys 3 Lab</i> <small>(note: add'l 1 cr hr applied to free elect)</small>	CHEN 4838-3 <input type="checkbox"/> <i>Energy Fundamentals</i> F	Energy Elective: <input type="checkbox"/> <small>(3 cr hr min)</small>

F - Course normally taught *ONLY* in the fall
S - Course normally taught *ONLY* in the spring

Minimum academic standards:
(MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Environmental Option

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry	ChemE Core			
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S <small>(alt MCDB 1150 or EBIO 1210/1230)</small>	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S <small>(alt. MCEN 3021) <input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> <small>(no prereqs)</small>	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F <small>(alt MCEN 3022)</small> <small><input type="checkbox"/> CHEN 3200 or MCEN 3021</small>	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350</small>	Adv. Chem Elect. <input type="checkbox"/> <small>(prereqs vary)</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	Physics PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <small><input type="checkbox"/> APPM 1350 coreq.</small>		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	Tech Electives (Total of 16 cr hrs, 6 cr hr must be CHEN 3000+)		
			CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S <small>(not req'd)</small>	CVEN 3414-3 <input type="checkbox"/> <i>Fund. Env. Eng.</i> F	Env. Science Elec. <input type="checkbox"/> <small>(3 cr hr min)</small>
Free Electives <small>(4 cr. min)</small> List: <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/>			H&SS (9 upper and 9 lower req'd) Lower Level <input type="checkbox"/> List: <input type="checkbox"/> 1) <input type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>		
			Env. Eng. Elective 1: <input type="checkbox"/> <small>(3 cr hr min)</small>	Env. Eng. Elective 2: <input type="checkbox"/> <small>(3 cr hr min)</small>	Env. Eng. Elective 3: <input type="checkbox"/> <small>(3 cr hr min)</small>
NOTE: At least one Env. Eng. El must be CHEN 4670, CHEN 4650, CHEN 4838: Energy Fundamentals or CHEN 3000+ Independent Study					

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Materials Option

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry		ChemE Core		
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S (alt MCDB 1150 or EBIO 1210/1230)	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S (alt. MCEN 3021) <small><input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F (alt MCEN 3022) <small><input type="checkbox"/> CHEN 3200 or MCEN 3021</small>	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350</small>	CHEM 4011-3 <input type="checkbox"/> <i>Inorganic Chemistry</i> <small><input type="checkbox"/> CHEM 4521</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	Physics		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	Tech Electives (Total of 16 cr hrs; 6 cr hrs must be CHEN 3000+)		
			CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S (not req'd)	CHEN 3000+ <input type="checkbox"/> <i>Independent Study</i> (3 cr hr min)	Tech Elective 1: <input type="checkbox"/> (3 cr hr min)
			Tech Elective 2: <input type="checkbox"/> (3 cr hr min)	Materials Elective 1: <input type="checkbox"/> (3 cr hr min)	Materials Elective 2: <input type="checkbox"/> (3 cr hr min)
Free Electives (4 cr. min) List: 1) 2)			H&SS (9 upper and 9 lower req'd)		
			Lower Level List: 1) 2) 3)	Upper Level (3000+) 1) WRTG 3030 2) 3)	

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards: (MAPS) <input type="checkbox"/> OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical Engineering Graduation Checklist - Microelectronics Option

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*128 cr hrs required

Math/Computing	Chemistry		ChemE Core		
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S <small>(alt MCDB 1150 or EBIO 1210/1230)</small>	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S <small>(alt. MCEN 3021) <input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> <small>(no prereqs)</small>	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F <small>(alt MCEN 3022) <input type="checkbox"/> CHEN 3200 or MCEN 3021</small>	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEM 3320</small>
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350</small>	CHEM 4011-3 <input type="checkbox"/> <i>Inorganic Chemistry</i> <small><input type="checkbox"/> CHEM 4521</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	OR CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 3320</small>
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	Physics PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <small><input type="checkbox"/> APPM 1350 coreq.</small>		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	Tech Electives (Total of 16 cr hrs; 6 cr hrs must be CHEN 3000+)		
Free Electives (4 cr hr) Free Elective (3 cr hr min)			CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S <small>(not req'd)</small>	ECEN 3030-3 <input type="checkbox"/> OR MCEN 3017-3 <i>Circuits</i>	PHYS 2130-3 <input type="checkbox"/> <i>Physics 3</i> and PHYS 2150-1 <i>Phys 3 Lab</i> <small>(1 add'l cr is free elect)</small>
H&SS (9 upper and 9 lower req'd) Lower Level List: 1) _____ 2) _____ 3) _____ <small>(Phys 3 Lab counts as remaining free elective)</small>			Upper Level (3000+) 1) WRTG 3030 2) _____ 3) _____	Tech Elective 1: <input type="checkbox"/> <small>(3 cr hr min) CHEN 3000+</small>	Tech Elective 2: <input type="checkbox"/> <small>(3 cr hr min) CHEN 3000+</small>

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Pre-Med Chemical Engineering Graduation Checklist

[effective for students entering in Fall 2008 and after]

Name: _____

Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*129 total cr. Required

Math/Computing	Chemistry			ChemE Core		
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small> APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEN 1221 coreq.</small> CHEN 1131-5 <input type="checkbox"/> General Chemistry 2 <small><input type="checkbox"/> CHEN 1211</small>	CHEN 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEN 1211 coreq.</small>	MCDB 1150-3 <input type="checkbox"/> <i>Intro MCDB/Lab</i> F (Note: MCDB 1151-1 must also be taken - see Tech Elective section) CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer (alt MCEN 3022)</i> F <small><input type="checkbox"/> CHEN 3200 or MCEN 3021</small>	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEN 1211</small> CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEN 4511 or 4521</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids (alt. MCEN 3021)</i> S <small><input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small> CHEN 3320-3 <input type="checkbox"/> <i>Sep Mass Transfer</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEN 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEN 3311 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4330-3 <input type="checkbox"/> <i>Kinetics</i> <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4440-3 <input type="checkbox"/> <i>Materials</i> S <small><input type="checkbox"/> CHEN 3311 <input type="checkbox"/> CHEN 3320</small> <p style="text-align: center;">OR</p> CHEN 4460-3 <input type="checkbox"/> <i>Polymer Engineering</i> <small><input type="checkbox"/> CHEN 3311 <input type="checkbox"/> CHEN 3320</small>	
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEN 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEN 3331 coreq.</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4130-2 <input type="checkbox"/> <i>ChE Lab 2</i> F <small><input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEN 1211 <input type="checkbox"/> APPM 2350</small>	CHEM 4611-3 <input type="checkbox"/> <i>Survey Biochemistry</i> <small><input type="checkbox"/> CHEN 3331</small>	CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	Physics			Technical Electives (Total of 16 cr hrs)		
	PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <small><input type="checkbox"/> APPM 1350 coreq.</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE (not req'd)</i> S	Tech Elective 1: <input type="checkbox"/> MCDB 1151-1 F <i>MCDB Lab</i> <small><input type="checkbox"/> MCDB 1150 coreq.</small>	
	H&SS (9 upper and 9 lower req'd)			Tech Elective 2: <input type="checkbox"/> MCDB 2150-3 and MCDB 2151-1 <small><input type="checkbox"/> MCDB 1150</small>	Tech Elective 3: <input type="checkbox"/> (4 cr hr min)	
	Lower Level List: 1) _____ 2) Literature Elective ↖ (note: these can be switched) ↗ 3) Literature Elective ↖ (note: these can be switched) ↗	Upper Level (3000+) 1) WRTG 3030 2) _____ 3) _____		Tech Elective 4: <input type="checkbox"/> CHEN 3000+ (3 cr hr min)	Tech Elective 5: <input type="checkbox"/> CHEN 3000+ (3 cr hr min)	

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Chemical and Biological Engineering Graduation Checklist

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

Math/Computing	Chemistry		ChemE Core		
GEEN 1300-3 <input type="checkbox"/> <input type="checkbox"/> APPM 1350 coreq.	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <input type="checkbox"/> CHEM 1221 coreq.	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <input type="checkbox"/> CHEM 1211 coreq.	CHEN 2810-3 <input type="checkbox"/> <i>Biol. for Eng.</i> S (alt MCDB 1150 or EBIO 1210/1230)	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S (alt. MCEN 3021) <input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <input type="checkbox"/> CHEM 1211	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <input type="checkbox"/> CHEM 3311 coreq.	CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F (alt MCEN 3022) <input type="checkbox"/> CHEN 3200 or MCEN 3021	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <input type="checkbox"/> APPM 1350	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <input type="checkbox"/> CHEM 3311/3321	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <input type="checkbox"/> CHEM 3331 coreq.	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022	CHEN 4830-3 <input type="checkbox"/> <i>Biokinetics</i> S <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210	CHEN 4805-3 <input type="checkbox"/> <i>Biomaterials</i> S <input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 2810
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <input type="checkbox"/> APPM 1360	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350	CHEM 4611-3 <input type="checkbox"/> <i>Survey Biochemistry</i> <input type="checkbox"/> CHEM 3331	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4810-2 <input type="checkbox"/> <i>CBEN Lab 2</i> F <input type="checkbox"/> CHEN 2810 <input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 4820 coreq.	CHEN 4820-3 <input type="checkbox"/> <i>Bioseparations</i> F <input type="checkbox"/> CHEN 2810 <input type="checkbox"/> CHEN 3220
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <input type="checkbox"/> APPM 1360	Physics		CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <input type="checkbox"/> CHEN 4520	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4830
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <input type="checkbox"/> PHYS 1120 coreq.	Technical Electives (Total of 13 cr hrs)		
Free Electives			CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S (not req'd)	Tech Elective 1: <input type="checkbox"/>	
H&SS (9 upper and 9 lower req'd)			Tech Elective 2: <input type="checkbox"/>	Tech Elective 3: <input type="checkbox"/>	
(4 cr. min) List: 1) 2)	<u>Lower Level</u> List: 1) 2) 3)	<u>Upper Level</u> (3000+) 1) WRTG 3030 2) 3)	Focus Tech Elect: (3 cr hr min) (CHEN 3000+)		

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Pre-Med Chemical and Biological Engineering Graduation Checklist

[effective for students entering in Fall 2008 and after]

Name: _____ Student ID: _____

Prereqs/coreqs represented at bottom of box: e.g., " CHEN 3200" indicates that CHEN 3200 is a prereq for that course

*129 total cr. Required

Math/Computing	Chemistry		ChemE Core		
GEEN 1300-3 <input type="checkbox"/> <small><input type="checkbox"/> APPM 1350 coreq.</small>	CHEN 1211-3 <input type="checkbox"/> <i>Chem. for Eng.</i> <small><input type="checkbox"/> CHEM 1221 coreq.</small>	CHEM 1221-2 <input type="checkbox"/> <i>Chem Lab.</i> <small><input type="checkbox"/> CHEM 1211 coreq.</small>	MCDB 1150-3 <input type="checkbox"/> <i>Intro MCDB/Lab</i> F (Note: MCDB 1151-1 must also be taken - see Tech Elective section) <small><input type="checkbox"/> CHEM 3200 or MCEN 3021</small>	CHEN 2120-3 <input type="checkbox"/> <i>Mat. & En. Bal.</i> <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> CHEM 1211</small>	CHEN 3200-3 <input type="checkbox"/> <i>Fluids</i> S (alt. MCEN 3021) <small><input type="checkbox"/> CHEN 2120 or MCEN 2023 <input type="checkbox"/> APPM 2350 or 2360 <input type="checkbox"/> APPM 2360 coreq.</small>
APPM 1350-4 <input type="checkbox"/> <i>Calc 1</i> (no prereqs)	CHEM 1131-5 <input type="checkbox"/> General Chemistry 2 <small><input type="checkbox"/> CHEM 1211</small>		CHEN 3210-3 <input type="checkbox"/> <i>Heat Transfer</i> F (alt MCEN 3022)	CHEN 3320-3 <input type="checkbox"/> <i>Thermodynamics</i> F <small><input type="checkbox"/> CHEN 2120 <input type="checkbox"/> CHEM 4511 or 4521</small>	CHEN 3220-3 <input type="checkbox"/> <i>Sep. Mass Trans.</i> S <small><input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>
APPM 1360-4 <input type="checkbox"/> <i>Calc 2</i> <small><input type="checkbox"/> APPM 1350</small>	CHEM 3311-4 <input type="checkbox"/> <i>OChem 1</i> <small><input type="checkbox"/> CHEM 1211</small>	CHEM 3321-1 <input type="checkbox"/> <i>OChem Lab 1</i> <small><input type="checkbox"/> CHEM 3311 coreq.</small>	CHEN 3130-2 <input type="checkbox"/> <i>Junior Lab</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3200 <input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210 or MCEN 3022</small>	CHEN 4830-3 <input type="checkbox"/> <i>Biokinetics</i> S <small><input type="checkbox"/> CHEN 3320 <input type="checkbox"/> CHEN 3210</small>	CHEN 4805-3 <input type="checkbox"/> <i>Biomaterials</i> S <small><input type="checkbox"/> CHEM 3311 <input type="checkbox"/> CHEN 2810</small>
APPM 2350-4 <input type="checkbox"/> <i>Calc 3</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 3331-4 <input type="checkbox"/> <i>OChem 2</i> <small><input type="checkbox"/> CHEM 3311/3321</small>	CHEM 3341-1 <input type="checkbox"/> <i>OChem Lab 2</i> <small><input type="checkbox"/> CHEM 3331 coreq.</small>	CHEN 4090-1 <input type="checkbox"/> <i>Senior Seminar</i> F	CHEN 4810-2 <input type="checkbox"/> <i>CBEN Lab 2</i> F <small><input type="checkbox"/> CHEN 2810 <input type="checkbox"/> CHEN 3130 <input type="checkbox"/> CHEN 4820 coreq.</small>	CHEN 4820-3 <input type="checkbox"/> <i>Bioseparations</i> <small><input type="checkbox"/> CHEN 2810 <input type="checkbox"/> CHEN 3220</small>
APPM 2360-4 <input type="checkbox"/> <i>Lin. Al. Dif. Eq</i> <small><input type="checkbox"/> APPM 1360</small>	CHEM 4521-3 <input type="checkbox"/> <i>PChem 1</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> PHYS 1120 coreq. <input type="checkbox"/> CHEM 1211 <input type="checkbox"/> APPM 2350</small>	CHEM 4611-3 <input type="checkbox"/> <i>Survey Biochemistry</i> <small><input type="checkbox"/> CHEM 3331</small>	CHEN 4520-3 <input type="checkbox"/> <i>Design</i> F <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4330</small>	CHEN 4530-2 <input type="checkbox"/> <i>Design Project</i> S <small><input type="checkbox"/> CHEN 4520</small>	CHEN 4570-4 <input type="checkbox"/> <i>Process Control</i> S <small><input type="checkbox"/> CHEN 3010 <input type="checkbox"/> APPM 2360 <input type="checkbox"/> CHEN 3220 <input type="checkbox"/> CHEN 4830</small>
CHEN 3010-3 <input type="checkbox"/> <i>App. Data. Anal.</i> F <small><input type="checkbox"/> GEEN 1300 <input type="checkbox"/> APPM 2360</small>	Physics		Technical Electives (Total of 13 cr hrs)		
	PHYS 1110-4 <input type="checkbox"/> <i>Physics 1</i> <small><input type="checkbox"/> APPM 1350 coreq.</small>	PHYS 1120-4 <input type="checkbox"/> <i>Physics 2</i> <small><input type="checkbox"/> PHYS 1110 <input type="checkbox"/> APPM 1360 coreq.</small>	PHYS 1140-1 <input type="checkbox"/> <i>Phys 2 Lab</i> <small><input type="checkbox"/> PHYS 1120 coreq.</small>	CHEN 1300-1 <input type="checkbox"/> <i>Intro. ChemE</i> S (not req'd)	Tech Elective 1: <input type="checkbox"/> MCDB 1151-1 F MCDB Lab <small><input type="checkbox"/> MCDB 1150 coreq.</small>
	H&SS (9 upper and 9 lower req'd)			Tech Elective 2: <input type="checkbox"/> MCDB 2150-3 and MCDB 2151-1 <small><input type="checkbox"/> MCDB 1150</small>	Tech Elective 3: <input type="checkbox"/> (4 cr hr min)
	Lower Level List: 1) _____ 2) Literature Elective ↖ (note: these can be switched) ↗	Upper Level (3000+) 1) WRTG 3030 2) _____ ↖ (note: these can be switched) ↗		Focus Tech Elect: <input type="checkbox"/> (3 cr hr min) (CHEN 3000+)	

F - Course normally taught *ONLY* in the fall
 S - Course normally taught *ONLY* in the spring

Minimum academic standards:
 (MAPS) OK

CRN 9/10

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Signed: _____ Date: _____

Curriculum Plan for B.S. in Chemical or Chemical and Biological Engineering

Student Name: _____

Student Number: _____

Fall	
Course No. & Title	CrHrs

Spring	
Course No. & Title	CrHrs

Summer: _____

Fall	
Course No. & Title	CrHrs

Spring	
Course No. & Title	CrHrs

Summer: _____

Fall	
Course No. & Title	CrHrs

Spring	
Course No. & Title	CrHrs

Summer: _____

Fall	
Course No. & Title	CrHrs

Spring	
Course No. & Title	CrHrs

Advisor: _____ Date: _____

Advisor: _____ Date: _____

Advisor: _____ Date: _____

Advisor: _____ Date: _____

Advisor: _____ Date: _____

Advisor: _____ Date: _____