Department of Chemical and Biological Engineering

Advising Guide 2022 - 2023

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Welcome to the Department of Chemical and Biological Engineering

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

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

Academic Advising Information

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

Your Responsibilities

You should

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

Your Academic Advisor's Responsibilities

Your academic advisor will:

- → Understand and communicate curriculum, requirements, policies, and procedures.
- → Assist you in making course and option decisions.
- → Assist you in understanding the purposes and goals of higher education.
- → Be accessible to you during posted office hours by email and/or phone.
- → Provide a safe place where you can share your thoughts, aspirations, concerns, and interests.
- → Provide resources, referrals, and strategies for using other campus resources.

→ Listen to your concerns and respect your individual values and choices.
→ Encourage and support you as you gain the skills and knowledge necessary for success.
→ Assist you in creating an educational plan that is consistent with those goals.
→ Help you find balance with your academic, social, and personal activities.

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

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

To schedule an appointment with your advisor, please use the online system at Buff Portal Advising.

Research Opportunities

The Department of Chemical and Biological Engineering has active research programs in biotechnology and tissue engineering, biosensing, bioengineering and pharmaceuticals, catalysis and surface science, computational science and engineering, energy, fluid and flows, interfaces and self-assembly, membranes and separations, nanomaterials and nanotechnology, polymers and soft materials, and protein engineering and synthetic biology. Undergraduate students make significant contributions to the research and creative work of the Department. Learn more on the website: https://www.colorado.edu/chbe/careers/undergraduate-resources.

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. Learn more on the website under the Undergraduate Research Tab: https://www.colorado.edu/chbe/academics/undergraduate-program/undergraduate-opportunities.

Student Professional and Honorary Societies

Many students find it most rewarding to participate in various professional and honorary societies. Learn more on the website: https://www.colorado.edu/chbe/academics/student-groups.

Curriculum Plans and Graduation Checklists

Both CHEN and CBEN curriculum plans and graduation checklists are on the following pages. Each plan outlines the curriculum with and without an accelerated chemistry course. All plans can be completed in 4 years, require the same number of credit hours, and cover the same chemistry content. Students with AP/IB chemistry credit or who take a chemistry placement exam can opt to take the accelerated chemistry course.

Chemical Engineering Plan

First Year Fall	14 Credits
APPM 1350 Calc 1 for Engineers	4
CHEN 1201 Gen Chem 1 for Eng	4
^&CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
**H&SS Elective	3

First Year Spring	17 Credits
APPM 1360 Calc 2 for Engineers	4
CHEM 1221 Gen Chem Lab for Eng	1
CHEN 1203 Gen Chem 2 for Eng	2
CHEN 2810 Bio for Engineers	3
PHYS 1110 Physics 1	4
**H&SS Elective	3

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Lab	1

Sophomore Year Spring	16 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3200 Fluid Mechanics	3
CHEN 4090 Undergrad Seminar	1
CHEN 4521 Physical Chem for Eng	3

Junior Year Fall	16 Credits
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
**College-Approved Writing	3
Free Elective	3

Junior Year Spring	18 Credits
CHEN 3220 Separations	3
CHEN 4330 Kinetics	3
CHEN 4440 Materials	3
^^Technical Elective	3
^^^Advanced Chemistry Elective	3
**H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4130 ChE Lab	3
CHEN 4520 Chem Process (Design)	3
^^Technical Elective	3
^^CHEN 3000 Technical Elective	3
**H&SS Elective	3

Senior Year Spring	15 Credits
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^^CHEN 3000 Technical Elective	3
^&Technical Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2.

^^15 Technical Electives: At least 1 credit must be an Engineering Technical Elective and at least 6 credits must be CHEN 3000+. Only 3 credits of CHEN 3000+ can be Independent Study Credits. Approved Technical and Engineering Technical Electives.

^^^Select from BCHM 4611 Principles of Biochemistry, CHEM 4011 Modern Inorganic, or CHEM 4531 Physical Chemistry 2.

**When selecting H&SS electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical Engineering Graduation Checklist

F = Fall Only S = Spring Only P = Prereq C = Coreq

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) Computing C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830) (or MATH 1300)	**CHEN 1201 (4) Eng Gen Chem 1**	**No Lab**	**CHEN 2810 (3) S Bio for Eng** (alt MCDB 1150) (alt EBIO 1210 & 1220)	**CHEN 2120 (3) Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
	CHEN 1203 (2) Eng Gen Chem 2	**CHEM 1221 (1) Gen Chem Lab**			
APPM 1350 (4) Calc 1 (alt MATH 1300)	**CHEM 3311 (4) O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1) O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S Seminar**	**CHEN 4521 (3) S P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) Calc 2 (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4) O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1) O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S Separations** P: CHEN 3210 P: CHEN 3320
APPM 2350 (4) Calc 3 (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4) Physics 1** P/C: APPM 1350	**Adv Chem Elect** **BCHM 4611** **CHEM 4011** **CHEM 4531**	**CHEN 4330 (3) S Kinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4440 (3) S Materials** P: CHEM 3311 P: CHEN 3320	**CHEN 4130 (3) F Lab** P: CHEN 3010 P: CHEN 3220 P: CHEN 3320 P: CHEN 4330
APPM 2360 (4) Diff Eq w/Lin Alg (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4) Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1) Exp Lab** P/C: PHYS 1120	**CHEN 4520 (3) F Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4330 or 4830	**CHEN 4530 (2) S Design Project** P: CHEN 4520	**CHEN 4570 (4) S Process Controls** P: APPM 2360 P: CHEN 3220 P: CHEN 4330 or 4830 P: PHYS 1120

3 Cr Free Elec	18 Cr H&SS (6 cr must be 3000+)		6 Cr CHEN 3000+ Tech Electives	
	Writing (3)		**CHEN 3000+ (3)**	
	3000+ (3)		**CHEN 3000+ (3)**	
	3000+ (3)		**9 Cr Gen Tech Electives (1 cr must be from Eng TE List)**	
	Any Level (3)			
	Any Level (3)			
	Any Level (3)			

Chemical Engineering Plan with Accelerated Chemistry

First Year Fall	15 Credits
APPM 1350 Calc 1 for Engineers	4
CHEM 1221 Gen Chem Lab for Eng	1
CHEN 1211 Accelerated Gen Chem	4
^&CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
**H&SS Elective	3

First Year Spring	16 Credits
APPM 1360 Calc 2 for Engineers	4
CHEN 2810 Bio for Engineers	3
PHYS 1110 Physics 1	4
**H&SS Elective	3
Free Elective	2

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Lab	1

Sophomore Year Spring	16 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3200 Fluid Mechanics	3
CHEN 4090 Undergrad Seminar	1
CHEN 4521 Physical Chem for Eng	3

Junior Year Fall	16 Credits
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
**College-Approved Writing	3
Free Elective	3

Junior Year Spring	18 Credits
CHEN 3220 Separations	3
CHEN 4330 Kinetics	3
CHEN 4440 Materials	3
^^Technical Elective	3
^^^Advanced Chemistry Elective	3
**H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4130 ChE Lab	3
CHEN 4520 Chem Process (Design)	3
^^Technical Elective	3
^^CHEN 3000 Technical Elective	3
**H&SS Elective	3

Senior Year Spring	15 Credits
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^^CHEN 3000 Technical Elective	3
^&Technical Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2.

^^15 Technical Electives: At least 1 credit must be an Engineering Technical Elective and at least 6 credits must be CHEN 3000+. Only 3 credits of CHEN 3000+ can be Independent Study Credits. Approved Technical and Engineering Technical Electives.

^^^Select from BCHM 4611 Principles of Biochemistry, CHEM 4011 Modern Inorganic, or CHEM 4531 Physical Chemistry 2.

**When selecting H&SS electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical Engineering Graduation Checklist with Accelerated Chemistry

F = Fall Only S = Spring Only P = Prereq C = Coreq

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) Computing C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830)) (or MATH 1300)	**CHEN 1211 (4) F Acc Gen Chem**	**CHEM 1221 (1) Gen Chem Lab**	**CHEN 2810 (3) S Bio for Eng** (alt MCDB 1150) (alt EBIO 1210 & 1220)	**CHEN 2120 (3) Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
APPM 1350 (4) Calc 1 (alt MATH 1300)	**CHEM 3311 (4) O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1) O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S Seminar**	**CHEN 4521 (3) S P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) Calc 2 (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4) O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1) O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S Separations** P: CHEN 3210 P: CHEN 3320
APPM 2350 (4) Calc 3 (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4) Physics 1** P/C: APPM 1350	**Adv Chem Elect** **BCHM 4611** **CHEM 4011** **CHEM 4531**	**CHEN 4330 (3) S Kinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4440 (3) S Materials** P: CHEM 3311 P: CHEN 3320	**CHEN 4130 (3) F Lab** P: CHEN 3010 P: CHEN 3220 P: CHEN 3320 P: CHEN 4330
APPM 2360 (4) Diff Eq w/Lin Alg (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4) Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1) Exp Lab** P/C: PHYS 1120	**CHEN 4520 (3) F Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4330 or 4830	**CHEN 4530 (2) S Design Project** P: CHEN 4520	**CHEN 4570 (4) S Process Controls** P: APPM 2360 P: CHEN 3220 P: CHEN 4330 or 4830 P: PHYS 1120
5 Cr Free Elec	**18 Cr H&SS (6 cr must be 3000+)**		**6 Cr CHEN 3000+ Tech Electives**		
	Writing (3)		**CHEN 3000+ (3)**		
	3000+ (3)		**CHEN 3000+ (3)**		
	3000+ (3)		**9 Cr Gen Tech Electives (1 cr must be from Eng TE List)**		
	Any Level (3)				
	Any Level (3)				
	Any Level (3)				

Chemical Engineering - Materials Option Plan

First Year Fall	14 Credits
APPM 1350 Calc 1 for Engineers	4
CHEN 1201 Gen Chem 1 for Eng	4
^&CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
**H&SS Elective	3

First Year Spring	17 Credits
APPM 1360 Calc 2 for Engineers	4
CHEM 1221 Gen Chem Lab for Eng	1
CHEN 1203 Gen Chem 2 for Eng	2
CHEN 2810 Bio for Engineers	3
PHYS 1110 Physics 1	4
**H&SS Elective	3

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Lab	1

Sophomore Year Spring	16 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3200 Fluid Mechanics	3
CHEN 4090 Undergrad Seminar	1
CHEN 4521 Physical Chem for Eng	3

Junior Year Fall	16 Credits
CHEM 4011 Modern Inorganic	3
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
**College-Approved Writing	3

Junior Year Spring	18 Credits
CHEN 3220 Separations	3
CHEN 4330 Kinetics	3
CHEN 4440 Materials	3
^^^Materials Elective	3
Free Elective	3
*H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4130 ChE Lab	3
CHEN 4520 Chem Process (Design)	3
^^^Materials Elective	3
^^Technical Elective	3
**H&SS Elective	3

Senior Year Spring	15 Credits
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^^Technical Elective	3
^&Technical Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2.

^^15 Technical Electives: At least 1 credit must be an Engineering Technical Elective and at least 6 credits must be CHEN 3000+. Approved Technical and Engineering Technical Electives.

^^^Suggested Materials Electives: CHEN 4450 Polymer Chemistry, CHEN 4460 Polymer Engineering, CHEN 4650 Particle Technology, CHEN 4805 Biomaterials, CHEN 4836 Nanomaterials (Cannot be taken if CHEN 4440 is taken.), or CHEN 4480 Solar Cells. ^^One of the CHEN 3000 Materials classes can be an Independent Study (CHEN 3840 or 4840) that can also count as one of your CHEN 3000+ Technical Electives.

**When selecting H&SS electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical Engineering - Materials Option Graduation Checklist

F = Fall Only S = Spring Only P = Prereq C = Coreq

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) Computing C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830) (or MATH 1300)	**CHEN 1201 (4) Eng Gen Chem 1**	**No Lab**	**CHEN 2810 (3) S Bio for Eng** (alt MCDB 1150) (alt EBIO 1210 & 1220)	**CHEN 2120 (3) Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
	CHEN 1203 (2) Eng Gen Chem 2	**CHEM 1221 (1) Gen Chem Lab**			
APPM 1350 (4) Calc 1 (alt MATH 1300)	**CHEM 3311 (4) O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1) O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S Seminar**	**CHEN 4521 (3) S P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) Calc 2 (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4) O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1) O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S Separations** P: CHEN 3210
APPM 2350 (4) Calc 3 (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4) Physics 1** P/C: APPM 1350	**CHEM 4011 (3) Mod Inorganic** P: CHEM 3331	**CHEN 4330 (3) S Kinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4440 (3) S Materials** P: CHEM 3311 P: CHEN 3320	**CHEN 4130 (3) F Lab** P: CHEN 3010 P: CHEN 3220 P: CHEN 3320 P: CHEN 4330
APPM 2360 (4) Diff Eq w/Lin Alg (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4) Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1) Exp Lab** P/C: PHYS 1120	**CHEN 4520 (3) F Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4330 or 4830	**CHEN 4530 (2) S Design Project** P: CHEN 4520	**CHEN 4570 (4) S Process Controls** P: APPM 2360 P: CHEN 3220 P: CHEN 4330 or 4830 P: PHYS 1120

3 Cr Free Elec	18 Cr H&SS (6 cr must be 3000+)		15 Cr TE (6 cr must be CHEN 3000+ / 1 cr must be En TE)	
	Writing (3)		**CHEN 3000+ (3)**	
	3000+ (3)		**CHEN 3000 Mat (3)**	
	3000+ (3)		**Materials Ele (3)**	
	Any Level (3)		**Gen TE (3)**	
	Any Level (3)		**Gen TE (3)**	
	Any Level (3)			

Chemical Engineering - Materials Option Plan with Accelerated Chemistry

First Year Fall	15 Credits
APPM 1350 Calc 1 for Engineers	4
CHEM 1221 Gen Chem Lab for Eng	1
CHEN 1211 Accelerated Gen Chem	4
^&CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
**H&SS Elective	3

First Year Spring	17 Credits
APPM 1360 Calc 2 for Engineers	4
CHEN 2810 Bio for Engineers	3
PHYS 1110 Physics 1	4
**H&SS Elective	3
Free Elective	3

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Lab	1

Sophomore Year Spring	16 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3200 Fluid Mechanics	3
CHEN 4090 Undergrad Seminar	1
CHEN 4521 Physical Chem for Eng	3

Junior Year Fall	16 Credits
CHEM 4011 Modern Inorganic	3
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
**College-Approved Writing	3

Junior Year Spring	18 Credits
CHEN 3220 Separations	3
CHEN 4330 Kinetics	3
CHEN 4440 Materials	3
^^^Materials Elective	3
Free Elective	3
*H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4130 ChE Lab	3
CHEN 4520 Chem Process (Design)	3
^^^Materials Elective	3
^^Technical Elective	3
**H&SS Elective	3

Senior Year Spring	15 Credits
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^^Technical Elective	3
^&Technical Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2.

^^15 Technical Electives: At least 1 credit must be an Engineering Technical Elective and at least 6 credits must be CHEN 3000+. Approved Technical and Engineering Technical Electives.

^^^Suggested Materials Electives: CHEN 4450 Polymer Chemistry, CHEN 4460 Polymer Engineering, CHEN 4650 Particle Technology, CHEN 4805 Biomaterials, CHEN 4836 Nanomaterials (Cannot be taken if CHEN 4440 is taken.), or CHEN 4480 Solar Cells. ^^One of the CHEN 3000 Materials classes can be an Independent Study (CHEN 3840 or 4840) that can also count as one of your CHEN 3000+ Technical Electives.

**When selecting H&SS electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical Engineering - Materials Option Graduation Checklist with Accelerated Chemistry

F = Fall Only S = Spring Only P = Prereq C = Coreq

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) Computing C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830) (or MATH 1300)	**CHEN 1211 (4) F Acc Gen Chem**	**CHEM 1221 (1) Gen Chem Lab**	**CHEN 2810 (3) S Bio for Eng** (alt MCDB 1150) (alt EBIO 1210 & 1220)	**CHEN 2120 (3) Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
APPM 1350 (4) Calc 1 (alt MATH 1300)	**CHEM 3311 (4) O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1) O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S Seminar**	**CHEN 4521 (3) S P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) Calc 2 (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4) O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1) O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S Separations** P: CHEN 3210
APPM 2350 (4) Calc 3 (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4) Physics 1** P/C: APPM 1350	**CHEM 4011 (3) Mod Inorganic** P: CHEM 3331	**CHEN 4330 (3) S Kinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4440 (3) S Materials** P: CHEM 3311 P: CHEN 3320	**CHEN 4130 (3) F Lab** P: CHEN 3010 P: CHEN 3220 P: CHEN 3320 P: CHEN 4330
APPM 2360 (4) Diff Eq w/Lin Alg (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4) Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1) Exp Lab** P/C: PHYS 1120	**CHEN 4520 (3) F Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4330 or 4830	**CHEN 4530 (2) S Design Project** P: CHEN 4520	**CHEN 4570 (4) S Process Controls** P: APPM 2360 P: CHEN 3220 P: CHEN 4330 or 4830 P: PHYS 1120
5 Cr Free Elec	**18 Cr H&SS (6 cr must be 3000+)**		**15 Cr TE (6 Cr must be CHEN 3000+ / 1 cr must be En TE)**		
	Writing (3)		**CHEN 3000+ (3)**		
	3000+ (3)		**CHEN 3000 Mat (3)**		
	3000+ (3)		**Materials Ele (3)**		
	Any Level (3)		**Gen TE (3)**		
	Any Level (3)		**Gen TE (3)**		
	Any Level (3)				

Chemical Engineering Premed Plan

First Year Fall	15 Credits
APPM 1350 Calc 1 for Engineers	4
CHEM 1114 Gen Chem 1 Lab	1
CHEN 1201 Gen Chem 1 for Eng	4
^CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
**H&SS Elective	3

First Year Spring	16 Credits
APPM 1360 Calc 2 for Engineers	4
CHEM 1133 Gen Chem 2	4
CHEM 1134 Gen Chem 2 Lab	1
PHYS 1110 Physics 1	4
**H&SS Elective	3

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
MCDB 1150 Intro to Cell Bio	3
^^MCDB Lab	2

Sophomore Year Spring	17 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEN 3200 Fluid Mechanics	3
CHEN 4521 Physical Chem for Eng	3
^^MCDB 2150 Genetics	3
PHYS 1120 Physics 2	4

Junior Year Fall	16 Credits
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
PHYS 1140 Exp Lab	1

Junior Year Spring	16 Credits
BCHM 4611 Princ of Biochem	3
CHEN 3320 Separations	3
CHEN 4090 Undergrad Seminar	1
CHEN 4330 Kinetics	3
**College-Approved Writing	3
**H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4130 ChE Lab	3
CHEN 4520 Chem Process (Design)	3
^^CHEN 3000 Technical Elective	3
^&Technical Elective	3
**H&SS Elective	3

Senior Year Spring	15 Credits
CHEN 4440 Materials	3
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^^CHEN 3000 Technical Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2.

^^15 Technical Electives: At least 1 credit must be an Engineering Technical Elective and at least 6 credits must be CHEN 3000+. Only 3 credits of CHEN 3000+ can be Independent Study Credits. Approved Technical and Engineering Technical Electives.

**When selecting H&SS electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical Engineering Premed Graduation Checklist

F = Fall Only S = Spring Only P = Prereq C = Coreq

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) Computing C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830) (or MATH 1300)	**CHEN 1201 (4) Eng Gen Chem 1** **CHEM 1133 (4) Gen Chem 2**	**CHEM 1114 (1) Gen Chem 1 Lab** **CHEM 1134 (1) Gen Chem 2 Lab**	**MCDB 1150 (3) S Intro to Cell Bio**	**CHEN 2120 (3) Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
APPM 1350 (4) Calc 1 (alt MATH 1300)	**CHEM 3311 (4) O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1) O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S Seminar**	**CHEN 4521 (3) S P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) Calc 2 (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4) O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1) O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S Separations** P: CHEN 3210
APPM 2350 (4) Calc 3 (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4) Physics 1** P/C: APPM 1350	**BCHM 4611 (3) Princ of BCHM** P: CHEM 3311	**CHEN 4330 (3) S Kinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4440 (3) S Materials** P: CHEM 3311 P: CHEN 3320	**CHEN 4130 (3) F Lab** P: CHEN 3010 P: CHEN 3220 P: CHEN 3320 P: CHEN 4330
APPM 2360 (4) Diff Eq w/Lin Alg (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4) Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1) Exp Lab** P/C: PHYS 1120	**CHEN 4520 (3) F Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4330 or 4830	**CHEN 4530 (2) S Design Project** P: CHEN 4520	**CHEN 4570 (4) S Process Controls** P: APPM 2360 P: CHEN 3220 P: CHEN 4330 or 4830 P: PHYS 1120

18 Cr H&SS (6 cr must be 3000+)		15 Cr TE (6 cr must be CHEN 3000+ / 1 cr must be En TE)	
Writing (3)		**CHEN 3000+ (3)**	
3000+ (3)		**CHEN 3000+ (3)**	
3000+ (3)		**MCDB Lab (2)**	
Any Level (3)		**MCDB 2150/2161 (5)**	
Any Level (3)		**Eng TE (1)**	
Any Level (3)		**Gen TE (1)**	

Chemical & Biological Engineering Plan

First Year Fall	14 Credits
APPM 1350 Calc 1 for Engineers	4
CHEN 1201 Gen Chem 1 for Eng	4
^CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
**H&SS Elective	3

First Year Spring	17 Credits
APPM 1360 Calc 2 for Engineers	4
CHEM 1221 Gen Chem Lab for Eng	1
CHEN 1203 Gen Chem 2 for Eng	2
CHEN 2810 Bio for Engineers	3
PHYS 1110 Physics 1	4
**H&SS Elective	3

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Lab	1

Sophomore Year Spring	16 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3200 Fluid Mechanics	3
CHEN 4090 Undergrad Seminar	1
CHEN 4521 Physical Chem for Eng	3

Junior Year Fall	16 Credits
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
**College-Approved Writing	3
Free Elective	3

Junior Year Spring	18 Credits
BCHM 4611 Princ of Biochemistry	3
CHEN 3220 Separations	3
CHEN 4805 Biomaterials	3
CHEN 4830 Biokinetics	3
**H&SS Elective	3
**H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4520 Chem Process (Design)	3
CHEN 4810 CBEN Lab	3
CHEN 4820 Bioseparations	3
^&Technical Elective	3
^^Technical Elective	3

Senior Year Spring	15 Credits
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^^Technical Elective	3
^^^Focus Technical Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2.

^^12 Technical Electives: At least 1 credit must be an Engineering Technical Elective and 3 credits must be a Focus Technical Elective. Approved Technical and Engineering Technical Electives.

^^^Focus Technical Elective options are CHEN 4801 Pharmaceutical Biotechnology, CHEN 4802 Tissue Engineering and Medical Devices, CHEN 4803 Metabolic Engineering, CHEN 4804 Protein and Enzyme Engineering, CHEN 4838 Data Projects, CHEN 4838 BioSims, and CHEN 4838 Immunoengineering.

**When selecting H&SS electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical & Biological Engineering Graduation Checklist

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) Computing C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830) (or MATH 1300)	**CHEN 1201 (4) Eng Chem 1**	**No Lab**	**CHEN 2810 (3) S Bio for Eng** (alt MCDB 1150) (alt EBIO 1210 & 1220)	**CHEN 2120 (3) Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
	CHEN 1203 (2) Eng Gen Chem 2	**CHEM 1221 (1) Gen Chem Lab**			
APPM 1350 (4) Calc 1 (alt MATH 1300)	**CHEM 3311 (4) O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1) O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S Seminar**	**CHEN 4521 (3) S P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) Calc 2 (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4) O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1) O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S Separations** P: CHEN 3210 P: CHEN 3320
APPM 2350 (4) Calc 3 (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4) Physics 1** P/C: APPM 1350	**BCHM 4611 (3) Princ of BCHM** P: CHEM 3311	**CHEN 4805 (3) S Biomaterials** P: CHEM 3311 P: CHEN 2810 P: CHEN 3320	**CHEN 4830 (3) S Biokinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4520 (3) F Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4830 or 4330
APPM 2360 (4) Diff Eq w/Lin Alg (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4) Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1) Exp Lab** P/C: PHYS 1120	**CHEN 4810 (3) F Lab** P: CHEN 2810 P: CHEN 3010 P: CHEN 4830 C: CHEN 4820	**CHEN 4820 (3) F Bioseparations** P: CHEN 3220	**CHEN 4530 (2) S Design Project** P: CHEN 4520

3 Cr Free Elect	18 Cr H&SS (6 cr must be 3000+)		CHEN 4570 (4) S Process Controls P: APPM 2360 P: CHEN 3220 P: CHEN 4330 or 4830 P: PHYS 1120	9 Cr Gen TE (1 cr must be Eng TE)
	Writing (3)			
	3000+ (3)			
	3000+ (3)			
	Any Level (3)			
	Any Level (3)		**1 Focus Tech Elective Required**	
	Any Level (3)		**CHEN 4801 (3) Pharmaceutical Biotechnology** P: CHEN 3320 and C: CHEN 4830 or 4330 **CHEN 4802 (3) Tissue Engineering and Medical Devices** P: CHEN 2810 and C: CHEN 3320 **CHEN 4803 (3) Metabolic Engineering** P: BCHM 4611 and C CHEN 3320 **CHEN 4804 (3) Protein & Enzyme Engineering** P: BCHM 4611, CHEN 2810, and CHEN 3320 **CHEN 4838 (3) Special Topics**	

Chemical & Biological Engineering Plan with Accelerated Chemistry

First Year Fall	15 Credits
APPM 1350 Calc 1 for Engineers	4
CHEM 1221 Gen Chem Lab for Eng	1
CHEN 1211 Accelerated Gen Chem	4
^&CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
**H&SS Elective	3

First Year Spring	16 Credits
APPM 1360 Calc 2 for Engineers	4
CHEN 2810 Bio for Engineers	3
PHYS 1110 Physics 1	4
**H&SS Elective	3
Free Elective	2

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Lab	1

Sophomore Year Spring	16 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3200 Fluid Mechanics	3
CHEN 4090 Undergrad Seminar	1
CHEN 4521 Physical Chem for Eng	3

Junior Year Fall	16 Credits
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
**College-Approved Writing	3
Free Elective	3

Junior Year Spring	18 Credits
BCHM 4611 Princ of Biochemistry	3
CHEN 3220 Separations	3
CHEN 4805 Biomaterials	3
CHEN 4830 Biokinetics	3
**H&SS Elective	3
**H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4520 Chem Process (Design)	3
CHEN 4810 CBEN Lab	3
CHEN 4820 Bioseparations	3
^^Technical Elective	3
^^Technical Elective	3

Senior Year Spring	15 Credits
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^&Technical Elective	3
^^^Focus Technical Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2 credits.

^^12 Technical Electives: At least 1 credit must be an Engineering Technical Elective and 3 credits must be a Focus Technical Elective. Approved Technical and Engineering Technical Electives.

^^^Focus Technical Elective options are CHEN 4801 Pharmaceutical Biotechnology, CHEN 4802 Tissue Engineering and Medical Devices, CHEN 4803 Metabolic Engineering, CHEN 4804 Protein and Enzyme Engineering, CHEN 4838 Data Projects, CHEN 4838 BioSims, and CHEN 4838 Immunoengineering.

**When selecting H&SS electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical & Biological Engineering Graduation Checklist with Accelerated Chemistry

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) S **Computing** C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830) (or MATH 1300)	**CHEN 1211 (4) F** **Acc Gen Chem**	**CHEM 1221 (1)** **Gen Chem Lab**	**CHEN 2810 (3) S** **Bio for Eng** (alt MCDB 1150) (alt EBIO 1210 & 1220)	**CHEN 2120 (3)** **Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S** **Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
APPM 1350 (4) **Calc 1** (alt MATH 1300)	**CHEM 3311 (4)** **O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1)** **O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S** **Seminar**	**CHEN 4521 (3) S** **P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F** **App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) **Calc 2** (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4)** **O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1)** **O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F** **Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F** **Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S** **Separations** P: CHEN 3210 P: CHEN 3320
APPM 2350 (4) **Calc 3** (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4)** **Physics 1** P/C: APPM 1350	**BCHM 4611 (3)** **Princ of BCHM** P: CHEM 3311	**CHEN 4805 (3) S** **Biomaterials** P: CHEM 3311 P: CHEN 2810 P: CHEN 3320	**CHEN 4830 (3) S** **Biokinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4520 (3) F** **Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4830 or 4330
APPM 2360 (4) **Diff Eq w/Lin Alg** (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4)** **Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1)** **Exp Lab** P/C: PHYS 1120	**CHEN 4810 (3) F** **Lab** P: CHEN 2810 P: CHEN 3010 P: CHEN 4830 C: CHEN 4820	**CHEN 4820 (3) F** **Bioseparations** P: CHEN 3220	**CHEN 4530 (2) S** **Design Project** P: CHEN 4520

5 Cr Free Elect	18 Cr H&SS (6 cr must be 3000+)		CHEN 4570 (4) S Process Controls P: APPM 2360 P: CHEN 3220 P: CHEN 4330 or 4830 P: PHYS 1120	9 Cr Gen TE (1 cr must be Eng TE)
	Writing (3)			
	3000+ (3)			
	3000+ (3)			
	Any Level (3)			
	Any Level (3)		**1 Focus Tech Elective Required**	
	Any Level (3)		**CHEN 4801 (3) Pharmaceutical Biotechnology** P: CHEN 3320 and C: CHEN 4830 or 4330 **CHEN 4802 (3) Tissue Engineering and Medical Devices** P: CHEN 2810 and C: CHEN 3320 **CHEN 4803 (3) Metabolic Engineering** P: BCHM 4611 and C CHEN 3320 **CHEN 4804 (3) Protein & Enzyme Engineering** P: BCHM 4611, CHEN 2810, and CHEN 3320 **CHEN 4838 (3) Special Topics**	

Chemical & Biological Engineering Premed Plan

First Year Fall	15 Credits
APPM 1350 Calc 1 for Engineers	4
CHEM 1114 Gen Chem 1 Lab	1
CHEN 1201 Gen Chem 1 for Eng	4
^&CHEN 1300 Intro to ChE	(1)
CHEN 1310 Intro to Eng Computing	3
MCDB 1150 Intro to Cell Bio	3

First Year Spring	18 Credits
APPM 1360 Calc 2 for Engineers	4
CHEM 1133 Gen Chem 2	4
CHEM 1134 Gen Chem 2 Lab	1
PHYS 1110 Physics 1	4
^^MCDB Lab	2
**H&SS Elective	3

Sophomore Year Fall	17 Credits
APPM 2350 Calc 3 for Engineers	4
CHEM 3311 Organic Chem 1	4
CHEM 3321 Organic Chem 1 Lab	1
CHEN 2120 Material & Energy Bal	3
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Lab	1

Sophomore Year Spring	16 Credits
APPM 2360 Diff Eq w/Linear Alg	4
CHEM 3331 Organic Chem 2	4
CHEM 3341 Organic Chem 2 Lab	1
CHEN 3200 Fluid Mechanics	3
CHEN 4090 Undergrad Seminar	1
CHEN 4521 Physical Chem for Eng	3

Junior Year Fall	16 Credits
CHEN 3010 Applied Data Analysis	3
CHEN 3210 Heat & Mass Transfer	4
CHEN 3320 Thermodynamics	3
^^MCDB 2150 Genetics	3
**College-Approved Writing	3

Junior Year Spring	17 Credits
BCHM 4611 Princ of Biochemistry	3
CHEN 3220 Separations	3
CHEN 4805 Biomaterials	3
CHEN 4830 Biokinetics	3
^&Technical Elective	2
**H&SS Elective	3

Senior Year Fall	15 Credits
CHEN 4520 Chem Process (Design)	3
CHEN 4810 CBEN Lab	3
CHEN 4820 Bioseparations	3
^&Technical Elective	3
**H&SS Elective	3

Senior Year Spring	15 Credits
CHEN 4530 Design Project	2
CHEN 4570 Process Control	4
^^^Focus Technical Elective	3
**H&SS Elective	3
**H&SS Elective	3

^&If CHEN 1300 is taken, one of the Technical Elective courses will reduce from 3 to 2 credits.

^^12 Technical Electives: At least 1 credit must be an Engineering Technical Elective and 3 credits must be a Focus Technical Elective. Approved Technical and Engineering Technical Electives. You should make an appointment with a Pre-Health Advisor for assistance selecting your Technical Electives.

^^^Focus Technical Elective options are CHEN 4801 Pharmaceutical Biotechnology, CHEN 4802 Tissue Engineering and Medical Devices, CHEN 4803 Metabolic Engineering, CHEN 4804 Protein and Enzyme Engineering, CHEN 4838 Data Projects, CHEN 4838 BioSims, and CHEN 4838 Immunoengineering.

**When selecting H&SS Electives and the College-Approved Writing Course, consult the College's degree requirements.

Chemical & Biological Engineering Premed Graduation Checklist

Math/Computing	Chemistry & Physics		Engineering, Biology, & Physical Chemistry Courses		
CHEN 1310 (3) Computing C: APPM 1350 (or APPM 1340) (or APPM 1345) (or GEEN 3830) (or MATH 1300)	**CHEN 1201 (4) Eng Gen Chem 1**	**CHEM 1114 (1) Gen Chem 1 Lab**	**MCDB 1150 (3) Intro to Cell Bio**	**CHEN 2120 (3) Mat & En Bal** P: CHEN 1211 C: CHEN 1203 C: CHEN 1310 **Minimum grade of C is required.**	**CHEN 3200 (3) S Fluids** (alt MCEN 3021) P: APPM 2350 P: CHEN 2120 P: PHYS 1110 C: APPM 2360
	CHEM 1133 (4) Gen Chem 2	**CHEM 1134 (1) Gen Chem 2 Lab**			
APPM 1350 (4) Calc 1 (alt MATH 1300)	**CHEM 3311 (4) O Chem 1** P: CHEN 1211 & CHEM 1221 C: CHEM 3321	**CHEM 3321 (1) O Chem 1 Lab** P: CHEN 1211 & CHEM 1221 C: CHEM 3311	**CHEN 4090 (1) S Seminar**	**CHEN 4521 (3) S P Chem for Eng** (alt CHEM 4511 & 4531) P: APPM 2350 P: CHEN 1211 C: APPM 2360	**CHEN 3010 (3) F App Data** (alt STAT 4000 & 4010) P: APPM 2360 P: CHEN 1310
APPM 1360 (4) Calc 2 (alt MATH 2300) P: APPM 1350	**CHEM 3331 (4) O Chem 2** P: CHEM 3311/3321 C: CHEM 3341	**CHEM 3341 (1) O Chem 2 Lab** P: CHEM 3311/3321 C: CHEM 3331	**CHEN 3210 (4) F Heat & Mass Tr** P: CHEN 3200 (or MCEN 3021)	**CHEN 3320 (3) F Thermo** P: CHEN 2120 P: CHEN 4521 (or P: CHEM 4511 & C: CHEM 4531)	**CHEN 3220 (3) S Separations** P: CHEN 3210 P: CHEN 3320
APPM 2350 (4) Calc 3 (alt MATH 2400) P: APPM 1360	**PHYS 1110 (4) Physics 1** P/C: APPM 1350	**BCHM 4611 (3) Princ of BCHM** P: CHEM 3311	**CHEN 4805 (3) S Biomaterials** P: CHEM 3311 P: CHEN 2810 P: CHEN 3320	**CHEN 4830 (3) S Biokinetics** P: APPM 2360 P: CHEN 3210 P: CHEN 3320	**CHEN 4520 (3) F Design** P: CHEN 3010 P: CHEN 3210 P: CHEN 3220 P: CHEN 4830 or 4330
APPM 2360 (4) Diff Eq w/Lin Alg (alt MATH 2130 & 3130) P: APPM 1360	**PHYS 1120 (4) Physics 2** P: PHYS 1110 P/C: APPM 1360	**PHYS 1140 (1) Exp Lab** P/C: PHYS 1120	**CHEN 4810 (3) F Lab** P: CHEN 2810 P: CHEN 3010 P: CHEN 4830 C: CHEN 4820	**CHEN 4820 (3) F Bioseparations** P: CHEN 3220	**CHEN 4530 (2) S Design Project** P: CHEN 4520

18 Cr H&SS (6 cr must be 3000+)	
Writing (3)	
3000+ (3)	
3000+ (3)	
Any Level (3)	
Any Level (3)	
Any Level (3)	

CHEN 4570 (4) S Process Controls
P: APPM 2360
P: CHEN 3220
P: CHEN 4330 or 4830
P: PHYS 1120

9 Cr Gen TE (1 cr must be Eng TE)	
MCDB 1161 (2)	
MCDB 2150 (3)	
MCDB 2161 (2)	
Eng TE (1)	
Gen TE (1)	

1 Focus Tech Elective Required

CHEN 4801 (3) Pharmaceutical Biotechnology
P: CHEN 3320 and C: CHEN 4830 or 4330

CHEN 4802 (3) Tissue Engineering and Medical Devices
P: CHEN 2810 and C: CHEN 3320

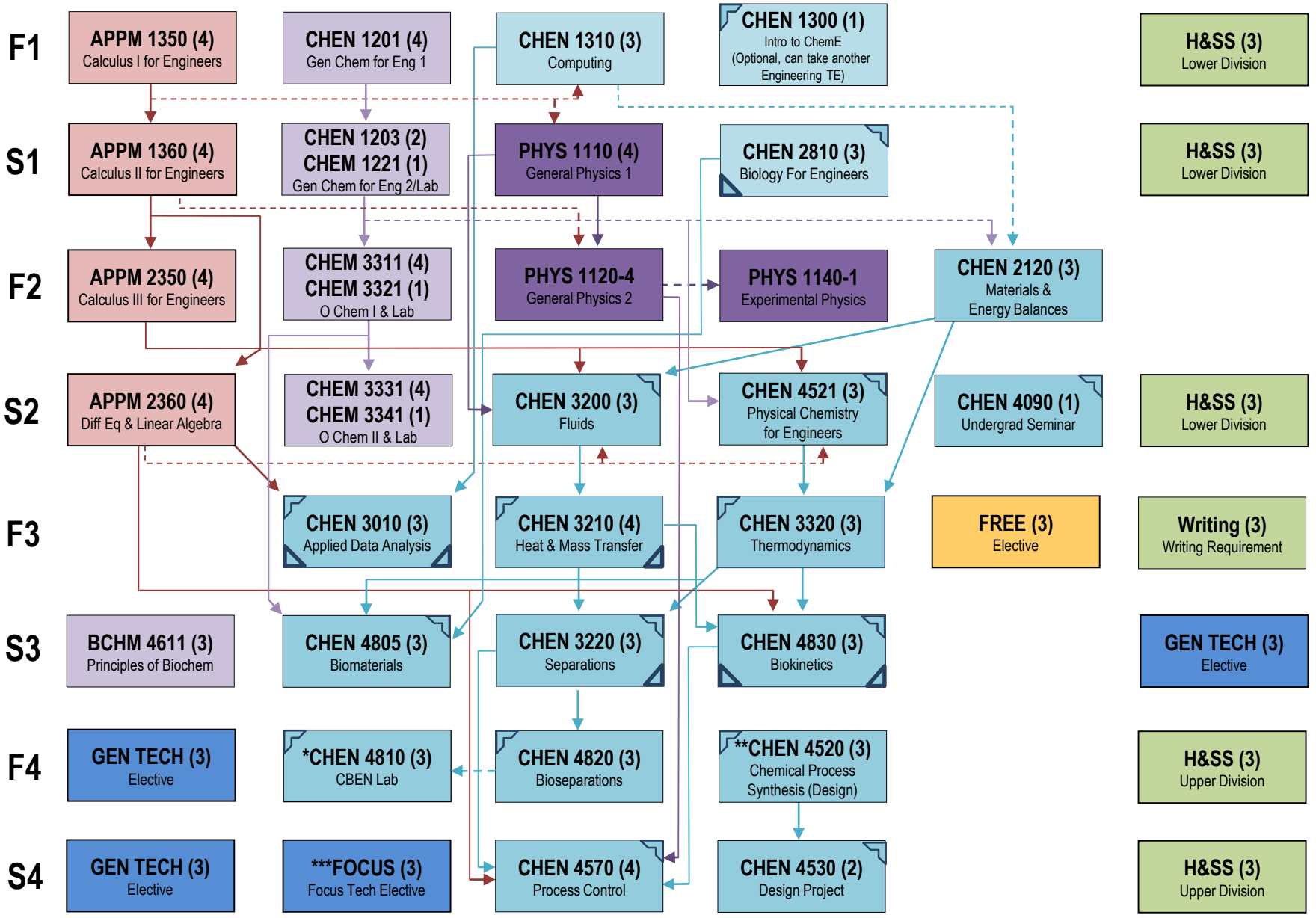
CHEN 4803 (3) Metabolic Engineering
P: BCHM 4611 and C CHEN 3320

CHEN 4804 (3) Protein & Enzyme Engineering
P: BCHM 4611, CHEN 2810, and CHEN 3320

CHEN 4838 (3) Special Topics

Flow Charts

CHEMICAL & BIOLOGICAL ENGINEERING CURRICULUM (4-Year Plan)



Accepted Course Substitutions

CHEN 2810 – MCDB 1150 or EBIO 1210 AND 1220
CHEN 3200 – MCEN 3021

Writing Requirement

The Writing Requirement can be fulfilled by ENES 1010 (freshmen only), ENES 3100, PHYS 3050, WRTG 3030, WRTG 3035, or ENLP 3100.

Humanities & Social Science Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

Engineering Technical Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

General Technical Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

***Focus Tech Elective

CBEN-BS students will take either:

- CHEN 4801 (3) – Pharmaceutical Biotechnology (P: CHEN 3320, P/C: CHEN 4830 or 4330)
- CHEN 4802 (3) – Tissue Engineering & Biomedical Devices (P: CHEN 2810 or equivalent, Department restrictions apply)
- CHEN 4803 (3) – Metabolic Engineering (P: BCHM 4611)
- CHEN 4838 (3) – Protein & Enzyme Engineering (P: CHEN 2810, CHEN 3320, and BCHM 4611)

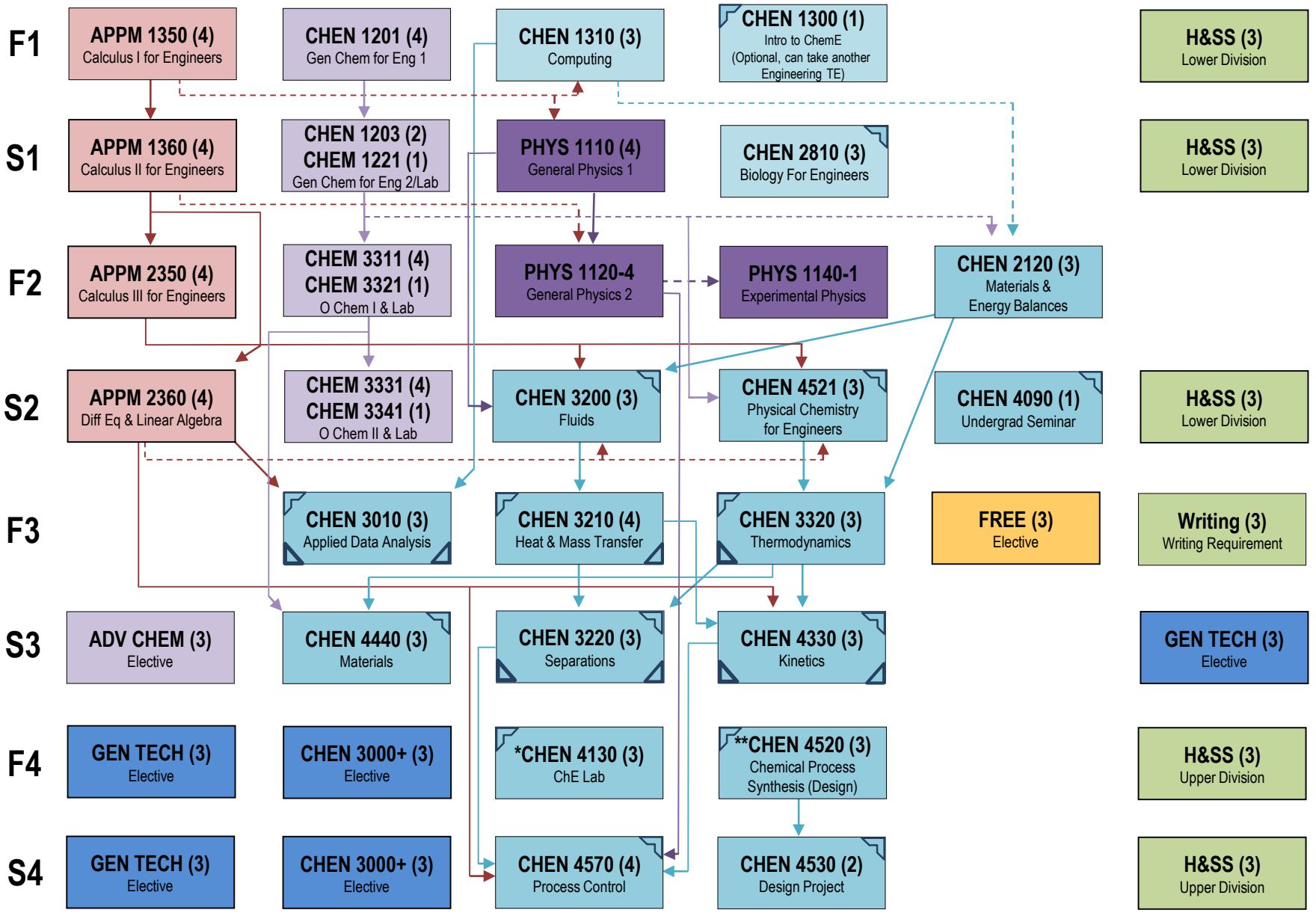
These courses are offered on a rotating basis. Please note that this means you may not always be able to take the specific course you want. If possible, we recommend completing the pre-requisites well in advance.

Grade Requirements

The minimum passing grade for prerequisite and corequisite classes in our curriculum is a C-. This includes courses completed outside the department (APPM, PHYS, etc.). A MINIMUM grade of C is required for CHEN 2120.

In addition, students need to have a cumulative and major GPA of at least 2.0 in order to graduate from the College of Engineering.

CHEMICAL ENGINEERING CURRICULUM (4-Year Plan)



Accepted Course Substitutions

CHEN 2810 – MCDB 1150 or EBIO 1210 AND 1220
CHEN 3200 – MCEN 3021

Writing Requirement

The Writing Requirement can be fulfilled by ENES 1010 (freshmen only), ENES 3100, PHYS 3050, WRTG 3030, WRTG 3035, or ENLP 3100.

Humanities & Social Science Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

Engineering Technical Electives

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General Technical Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

CHEN 3000+ Electives

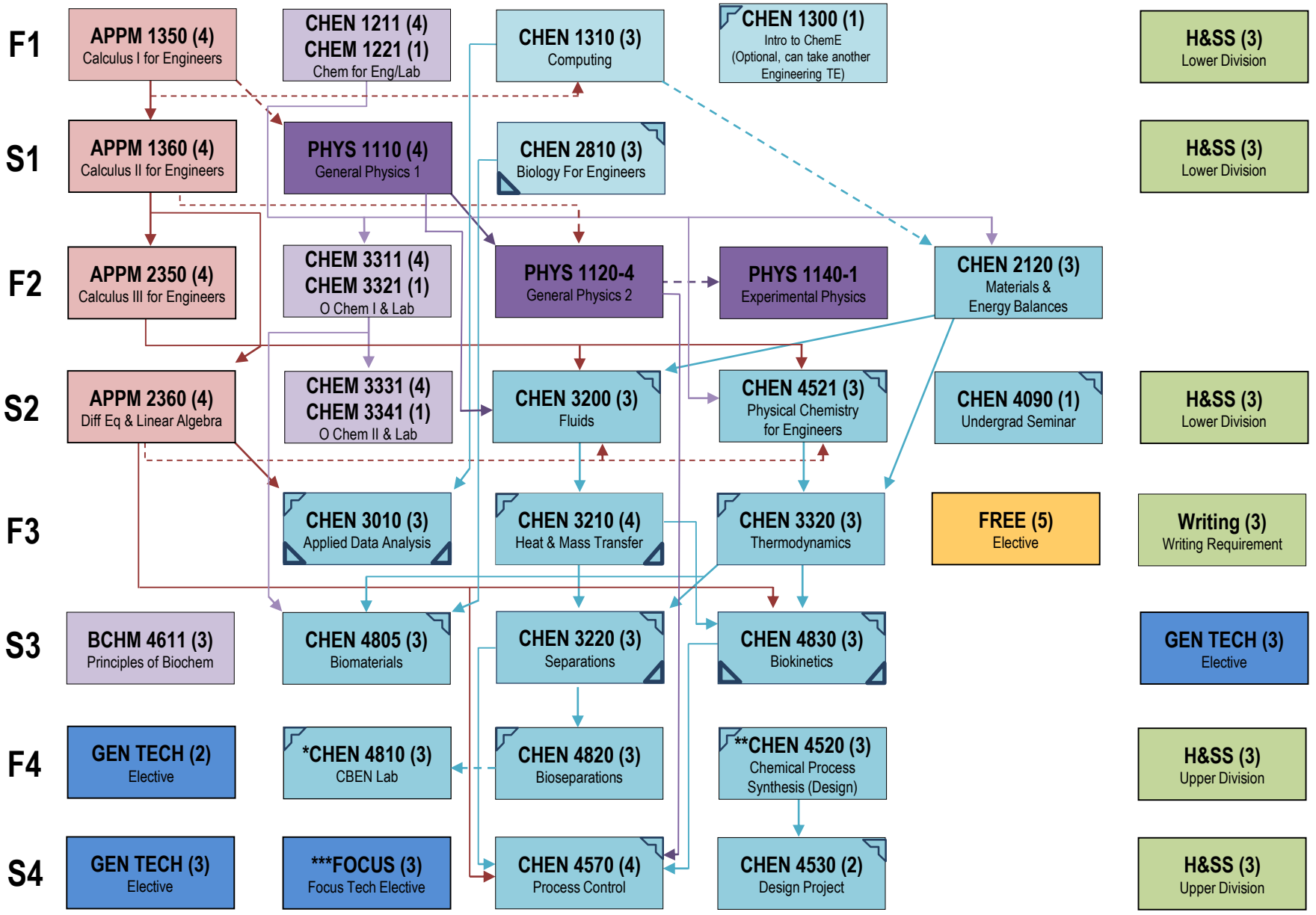
3000 and 4000 level CHEN courses not otherwise required for the major are considered to be CHEN 3000+ Technical Electives. BS/MS students have the same course options, but should complete the classes at the 5000 level.

Grade Requirements

The minimum passing grade for prerequisite and corequisite classes in our curriculum is a C-. This includes courses completed outside the department (APPM, PHYS, etc.). A MINIMUM grade of C is required for CHEN 2120.

In addition, students need to have a cumulative and major GPA of at least 2.0 in order to graduate from the College of Engineering.

CHEMICAL & BIOLOGICAL ENGINEERING CURRICULUM Accelerated Chemistry (4-Year Plan)



Accepted Course Substitutions

CHEN 2810 – MCDB 1150 or EBIO 1210 AND 1220
CHEN 3200 – MCEN 3021

Writing Requirement

The Writing Requirement can be fulfilled by ENES 1010 (freshmen only), ENES 3100, PHYS 3050, WRTG 3030, WRTG 3035, or ENLP 3100.

Humanities & Social Science Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

Engineering Technical Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

General Technical Electives

Please refer to the ChBE Undergraduate Advising page at http://www.colorado.edu/chbe/academics/undergraduate-program/current-students.

***Focus Tech Elective

CBEN-BS students will take either:

- CHEN 4801 (3) – Pharmaceutical Biotechnology (P: CHEN 3320, P/C: CHEN 4830 or 4330)
- CHEN 4802 (3) – Tissue Engineering & Biomedical Devices (P: CHEN 2810 or equivalent, Department restrictions apply)
- CHEN 4803 (3) – Metabolic Engineering (P: BCHM 4611)
- CHEN 4838 (3) – Protein & Enzyme Engineering (P: CHEN 2810, CHEN 3320, and BCHM 4611)

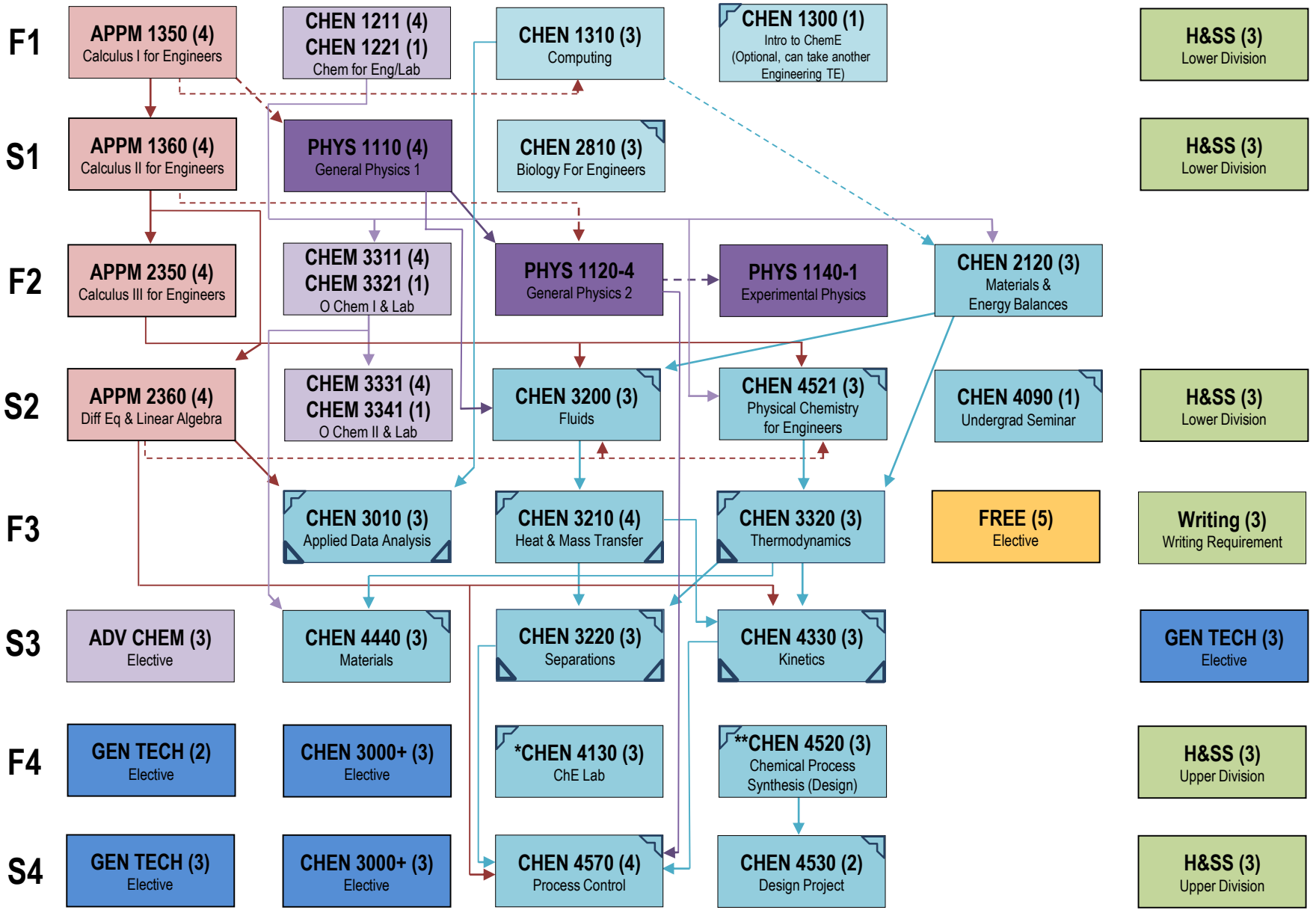
These courses are offered on a rotating basis. Please note that this means you may not always be able to take the specific course you want. If possible, we recommend completing the pre-requisites well in advance.

Grade Requirements

The minimum passing grade for prerequisite and corequisite classes in our curriculum is a C-. This includes courses completed outside the department (APPM, PHYS, etc.). A MINIMUM grade of C is required for CHEN 2120.

In addition, students need to have a cumulative and major GPA of at least 2.0 in order to graduate from the College of Engineering.

CHEMICAL ENGINEERING CURRICULUM Accelerated Chemistry (4-Year Plan)



Accepted Course Substitutions

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Writing Requirement

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