

Curriculum in this handbook directly applies to students who enter the CHE major

Chemical Engineering Advising Handbook

This Handbook summarizes the academic requirements of the Chemical Engineering Curriculum for students starting in Summer 2025 or later.



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Introduction to the Department

The Chemical Engineering Department is a vibrant academic unit with activities spanning undergraduate and graduate education, research, and service to the field. We have approximately 35 faculty members, 110 graduate students, and 350 undergraduate students in their 2nd year or beyond.

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Academic Requirements

The CHE major requires 133 credits for graduation. These are listed below.

GENERAL EDUCATION & OTHER GENERAL REQUIREMENTS (34 credits)

Note: Please see <https://genedplan.psu.edu/> for specific details about the general education requirements. These changed for students starting after Summer 2023.

FOR STUDENTS STARTING SUMMER 2023 OR AFTER

General education requirements for students starting after Summer 2023 (45 credits)

Note that you have 6 courses you can choose. Two Interdomains (N), one GA, one GHW, one GH and one extra exploration course.

	Prescribed	Choice
6 credits of quantification (GQ) (requires C or better)	MATH 140	
	MATH 141	
9 credits of Writing/Speaking (GWS) (requires C or better)	ENGL 15	
	CAS 100A or 100 B	
	ENGL 202C	
3 credits Natural Science (GN) stand-alone	CHEM 110	
3 credits Social Science (GS) stand-alone	ECON 102 or 104	
6 credits Inter-Domain (ID) will have N		ID #1 (with N)
		ID #2 (with N)
3 credits Arts (GA) stand-alone		GA (no N)
3 credits Health and Wellness (GHW) stand-alone		GHW (no N)
3 credits Humanities (GH) stand-alone		GH (no N)
9 credits of exploration	CHEM 112	
	PHYS 211	
3 credits of exploration		GA/GH/GS/GN/ID*

*** This can also be a World Language at the 12th credit level or higher. None of these courses can count for any other requirement of the major.**

FOR STUDENTS STARTING BEFORE SUMMER 2023

General education requirements for students starting before Summer 2023.

Note that you have 6 courses you can choose. Two Interdomains (N), one GA, one GHW, one GH and one extra exploration course.

	prescribed	Choice
6 credits of quantification (GQ) (requires C or better)	MATH140	
	MATH141	
9 credits of Writing/Speaking (GWS) (requires C or better)	ENGL15	
	CAS100A or 100B	
	ENGL202C	
9 credits Natural Science (GN)	CHEM110	
	CHEM112	
	PHYS211	
3 credits GS stand-alone	ECON102 or 104	
3 credits Arts (GA) stand-alone		GA (no N)
3 credits Health and Wellness (GHW) stand-alone		GHW (no N)
3 credits Humanities (GH) stand-alone		GH (no N)
3 credits of Interdomain (ID) with GA/GH/GN/GS**		ID #1 (with N)
3 credits of Interdomain (ID) with GA/GH/GN/GS**		ID #2 (with N)
3 credits of GA/GH/GS stand-alone or ID		GA/GH/GS or ID

Note that one of these courses must have a US component and one must have an IL component.

** together these courses must have at 6 credits in GA, GH and GS. You can also petition a move 3 so that there are only 3 stand-alone credits in one domain and 9 total credits in another.

MATH (14 credits)

MATH 140 Calculus With Analytic Geometry I (4) (C or better and ETM)*

MATH 141 Calculus with Analytic Geometry II (4) (C or better and ETM)*

MATH 231 Calculus of Several Variables (2)

MATH 251 Ordinary and Partial Differential Equations (4)

PHYSICS (8 credits)

PHYS 211 General Physics: Mechanics (4) (C or better and ETM)*

PHYS 212 General Physics: Electricity and Magnetism (4)

CHEMISTRY AND LIFE SCIENCES (16 credits)

CHEM 110 Chemical Principles I (3) (C or better and ETM)*

CHEM 111 Experimental Chemistry I (1)

CHEM 112 Chemical Principles II (3)

CHEM 113 Experimental Chemistry II (1)

CHEM 210 Organic Chemistry I (3)

CHEM 212 Organic Chemistry II (3)

CHEM 213 Laboratory in Organic Chemistry (2)

ENGINEERING DESIGN (3 credits)

EDSGN100 Cornerstone Engineering Design (3) (C or better and ETM)*

REQUIRED CHEMICAL ENGINEERING COURSES (35 credits)

CHE 210 Introduction to Material Balances (3) (C or better)

CHE 220 Introduction to Chemical Engineering Thermodynamics (3) (C or better)

CHE 230 Computational Tools for Chemical Engineering (1)

CHE 300 Professional Development Seminar (1) (Spring only)
CHE 320 Phase and Chemical Equilibria (3) **(C or better)**
CHE 330 Process Fluid Mechanics (3) **(C or better)**
CHE 340 Introduction to Biomolecular Engineering (3)
CHE 350 Process Heat Transfer (3) **(C or better)**
CHE 410 Mass Transfer Operations (3)
CHE 430 Chemical Reaction Engineering (3)
CHE 452 Chemical Process Safety (3)
CHE 470 Design of Chemical Plants (3)
CHE 480W Chemical Engineering Laboratory (3)

SCIENCE ELECTIVES (Includes Math and Statistics) (3 - 6 credits)

Students can select from an approved list of science courses ([Entire list of approved Engineering and Science Electives and Lab Experiences](#)). You must take at least 3 credits of science electives along with 9 credits of engineering electives or you can choose to take 6 credits of science electives and 6 credits of engineering electives.

*Note: students who entered the major before Summer 2025 can petition courses to replace BMB 251 and PCHEM elective.

ENGINEERING ELECTIVES (6 - 9 credits)

Student must take 6 – 9 credits of engineering courses. You can select 6 credits if you have 6 credits of science electives and 9 credits if you have 3 credits of science electives. Most students will choose from an approved list of engineering courses ([Entire list of approved Engineering and Science Electives and Lab Experiences](#)). Some students may find a course that is not on the approved list and may wish to petition this course as an engineering elective. Please note that engineering electives must be courses that have a strong technology component and build from a background in mathematics and science. Please check with your adviser and submit a petition through coursesub.psu.edu for consideration before assuming that any course not on the list in this handbook would count as an Engineering Elective. Many ENGR courses DO NOT count as Engineering Electives. If you petition a course, be sure to explain how it satisfied the following criteria.

Engineering sciences are based on mathematics and basic sciences but carry knowledge further toward creative application needed to solve engineering problems. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other.

LAB EXPERIENCE (2 credits)

Students are required to obtain 2 credits of a lab experience. This can include CHEM 457: Experimental Physical Chemistry but can also include research in chemical engineering (CHE 294, CHE 494, CHE 494) or in another department. Some students may choose to use this lab experience in a specific area of interest such as biology, material science, etc. Please see list below ([Entire list of approved Engineering and Science Electives and Lab Experiences](#)).

CHEMICAL ENGINEERING ELECTIVES (6 credits)

Take 6 credits in 400-level engineering electives from the following list (note that these are not guaranteed to be offered in the year you want to take them – please see current list of electives).

- CHE 412 CHE and the Environment
- CHE 423 Chemical Energy Technology
- CHE 432 (F SC 432) Petroleum Processing
- CHE 438 Bioprocess Engineering
- CHE 442 (MATSE 448) Polymer Processing Technology
- CHE 445 Bioremediation/Green Chemistry
- CHE 446 Transport Phenomena
- CHE 449 Bioseparations
- CHE 455 Drug Delivery, Pharmacokinetics, and Artificial Organs
- CHE 494 Research Projects in Chemical Engineering (see Note below)
- CHE 496 Independent Studies
- CHE 497 Special Topics in Chemical Engineering (see Note below)

Note on CHE 494: Students may use **up to 6 credits of CHE 494** towards graduation requirements in chemical engineering. Up to 3 credits may be used as a CHE 4XX elective. The other 3 credits can be used as engineering electives; professional electives or 2 credits can be used for the lab experience along with 1 credit as engineering elective or professional elective.

Note on CHE 496: This course is used for Independent Study of a topic under the direction of a faculty member. It is not to be used for scientific research.

Note on CHE 497: This is a generic course number for special topics that do not have a permanent course number. When multiple courses are offered on special topics, they will appear with numbers such as 497 with various section numbers. You can take multiple CHE 497 courses as long as the content is unique.

PROFESSIONAL ELECTIVES (6 credits)

Professional electives are a broad category of electives that give you the opportunity to enhance your portfolio of professional skills, to pursue minors, or to pursue topics of personal interest that are not covered by other elective categories. Acceptable courses must be at the 200-level or above. As a wide variety of courses may count as Professional Electives (including some below the 200-level), all courses that are appropriate will not automatically be placed in this category on your “Academic Requirements” record in LionPATH. If a course you intend as a Professional Elective does not automatically fall into that category in LionPATH, please submit a petition through coursesub.psu.edu and provide a brief description of how this course helped you develop as a student and/or professional.

Topics and Minors of Interest to Chemical Engineering Students

Chemical Engineering BS students may consider a wide array of topics when considering how to use their electives. These topics could be to add breadth or depth within the major. For students who want more depth, they may consider using the electives towards a minor. A typical PSU Minor requires 18 credits, but many Minors have some overlap with CHE such that credits can count towards both the CHE Major and a Minor. Below is a table showing some relevant departments and how the chemical engineering electives might overlap with courses in that department. Courses that are required for the minor are shown with an asterisk.

Chemical Engineering Electives that might overlap with Technical Engineering minors

	Required overlap	CHE elective	Engineering elective	Science elective	Lab experience
Biomedical Engineering	CHE 340*	CHE 438 CHE 445 CHE 449 CHE 455	BME 443 MATSE 403 MATSE 404 BME 4XX	BIOL 141 or BIOL 240W BME 201 or BMB 251 or BIOL 230W	BIOL 230W (1) BIOL 240W (1) Or CHE 494 (2)
Environmental Engineering	CHEM 210* CHE 210* CHE 330*	CHE 412 CHE 423	CE 370* CE 476, CE 475	CHEM 404	CHE 494 CE 496
Materials Science Engineering	CHE 320* CHE 430*	CHE 442	MATSE 201* MATSE 202 MATSE 401, 402 MATSE 443, 446	CHEM 480 CHEM 410	MATSE 460 (1) MATSE 462 (1) CHE 494 (2)
Nuclear Engineering	CHE 220 CHE 330		NUCE 301*, NUCE 302* NUCE 309* NUCE 310W*	PHYS 214 MATH 232	
Polymer Science	CHEM 210* MATH 231*		MATSE 202, 441 MATSE 443* MATSE 445, 446 MATSE 447		
Computational science			CMPSC (121, 131, 200 or 201) CMPSC 204*, 205* CMPSC 301*, 348*	STAT 200	CHE 494
Artificial Intelligence			A-I 305*, A-I 410* EE 456* CMPSC 448 or CMPSC 445*		
Energy Engineering	CHE 220** CHE350**	CHE 432 CHE 423	EGEE302 FSC 431 EGEE 441		EGEE 411W CHEM 425W CHE 494

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- * Denotes required course for minor
- ** use petition system at coursesub.psu.edu CHE 220 for EME 310 and CHE 350 for EME 304

Chemical Engineering Requirements that might overlap with Science Interest and Minors

	Required overlap	Science elective	Lab experience	Professional elective
Chemistry	CHEM 110 – 113* CHEM 210* CHEM 212* CHEM 213*	CHEM 227* CHEM 4XX	CHEM 457	CHEM 4XX (or GN)
MATH	MATH 140* MATH 141* MATH 231* MATH 251*	MATH 4XX MATH 4XX		MATH 4XX MATH 4XX
Physics	MATH 140* MATH 141* PHYS 211* PHYS 212**	PHYS 213 (1) PHYS 214 (1) PHYS 237 (3) 1 credit	PHYS 213 (1) PHYS 214 (1)	PHYS 4XX PHYS 4XX
BMB	CHEM 110* CHEM 112* CHEM 210* CHEM 212*	BMB 251 BMB 252	BMB442	BMB 400 BMB 401
Microbiology	CHEM 110* CHEM 112*	MICROB 201 MICROB 202	MICRB 421W	MICRO 251 MICRB 410

Chemical Engineering Requirements that might overlap with Leadership/Business Interests and Minors

	Engineering elective	Science elective	Professional elective
Leadership Development Minor	ENGR 408		ENGR 407 ENGR 409 ENGR 422
Product Innovation Entrepreneurship Certificate			ENGR 310 ENGR 407 ENGR 411
Business Certificate		STAT 200	ACCTG 211 BA 301 BA 302 BA 303 BA 304 BLAW 243 or IB 303

Minors of Interest to Chemical Engineering Students

Chemical Engineering BS students can consider a wide array of Minors to add to their undergraduate curriculum. A typical PSU Minor requires 18 credits, but many Minors have some overlap with CHE such that credits can count towards both the CHE Major and a Minor. Some Minors count courses required of the CHE Major towards the Minor requirements. Courses in many Minors can be counted as Professional Electives or Engineering Electives within the major, or towards General Ed requirements. The requirements of any Minor are defined by the Department in which that Minor is housed. Students are encouraged to reach out to an advisor in the minor department to discuss how chemical engineering courses can be used for the minor. Students are referred to the undergraduate bulletin (https://bulletins.psu.edu/programs/#filter=.filter_24) and individual department websites to find more information about specific minors.

Table. A partial list of Minors of particular interest to CHE students. Please note that you will need to contact an advisor for each minor to ensure that all requirements are met. The requirements of any Minor are defined by the Department in which that Minor is housed. Students are encouraged to reach out to an advisor in the minor department to discuss how chemical engineering courses can be used for the minor. Students are referred to the undergraduate bulletin (https://bulletins.psu.edu/programs/#filter=.filter_24) for more detail.

MINOR	CREDITS BEYOND CHE MAJOR*
Biomedical Engineering	0
Environmental Engineering	0
Materials Science and Engineering	0
Nuclear Engineering	0
Polymer Science (in MATSE)	3
Computational Engineering	3
Artificial Intelligence	3
Energy Engineering	0
Chemistry	0
Mathematics	0
Physics	0
Biochemistry and Molecular Biology	3 - 6
Microbiology	2 - 5
Engineering Leadership Development	3 - 9
Product Innovation Entrepreneurship Certificate	3
Business Certificate	12

* This value is the minimum number of extra credits needed provided a student maximizes the number of courses from the Minor that can also count towards the CHE Major, including as Professional or Engineering Electives.

Biomedical Engineering

<https://bulletins.psu.edu/undergraduate/colleges/engineering/biomedical-engineering-minor/#contacttext>

Environmental Engineering Minor

<https://bulletins.psu.edu/undergraduate/colleges/engineering/environmental-engineering-minor/>

Materials Science and Engineering Minor

<https://bulletins.psu.edu/undergraduate/colleges/capital/materials-science-engineering-minor/#programrequirements>

Nuclear Engineering Minor

<https://bulletins.psu.edu/undergraduate/colleges/engineering/nuclear-engineering-minor/#programrequirements>

Polymer Science Minor <https://bulletins.psu.edu/undergraduate/colleges/earth-mineral-sciences/polymer-science-minor/#programrequirements>

Computational Science Minor:

<https://bulletins.psu.edu/undergraduate/colleges/engineering/computational-sciences-minor/>

Artificial Intelligence Minor: <https://bulletins.psu.edu/undergraduate/colleges/engineering/artificial-intelligence-engineering-minor/#programrequirements>

Energy Engineering Minor <https://bulletins.psu.edu/undergraduate/colleges/earth-mineral-sciences/energy-engineering-minor/>

Chemistry Minor <https://bulletins.psu.edu/undergraduate/colleges/eberly-science/chemistry-minor/>

Mathematics Minor <https://bulletins.psu.edu/undergraduate/colleges/eberly-science/mathematics-minor/#programrequirements>

Physics Minor <https://bulletins.psu.edu/undergraduate/colleges/eberly-science/physics-minor/>

Biochemistry and Molecular Biology (BMB) <https://bulletins.psu.edu/undergraduate/colleges/eberly-science/biochemistry-molecular-biology-minor/#programrequirements>

Microbiology <https://bulletins.psu.edu/undergraduate/colleges/eberly-science/microbiology-minor/>

Engineering Leadership Development (ELD) (3 – 9 extra)

<https://www.sedi.psu.edu/eld/undergraduate/index.aspx>

- ENGR 408: Leadership Principles = Engineering Elective
- ENGR 407: Technology Based Entrepreneurship = Professional elective
- 3 credits of professional Elective + 3 Extra Credits
 - o ENGR 405: Project Management for Professionals or
 - o ENGR 409: Leadership in Organizations or
 - o ENGR 422: International Leadership of Virtual Teams

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- You can count 6 credits of your gen eds (GH, GA, ID) toward this minor.

Product Innovation Entrepreneurship Certificate (3 extra) <https://cpsse.psu.edu/product-innovation-entrepreneurship-certificate>

- ENGR 411: Entrepreneurship Business Basics = Professional Elective
- ENGR 310: Entrepreneurial Leadership = Professional Elective
- ENGR 407: Technology Based Entrepreneurship = EXTRA

Business certificate (12 extra credits) <https://bulletins.psu.edu/undergraduate/colleges/smeal-business/smeal-college-business-fundamentals-certificate/#programrequirements>

- STAT 200: Science Elective
- ECON 102: GS
- ACCTG 211: Financial and Managerial Accounting for Decision Making: Professional Elective
- BA 301: Finance: Professional Elective
- BA 302: Supply Chains: EXTRA
- BA 303: Marketing: EXTRA
- BA 304: Management and Organization: EXTRA
- BLAW 243: Legal Environment of Business or IB 303: International Business Operations: EXTRA

Prerequisites

The Chemical Engineering Department enforces all pre-requisites for required CHE classes. Students will not be able to schedule courses on LionPATH if they do not have the prerequisites. Pre-requisite waiver requests can be completed on LionPATH. These waivers are only granted in exceptional conditions, such as when a student took the pre-requisite course at another university and the credits are yet to transfer.

C Requirement

The following courses require a C or better: ENGL15, CAS100A/B, ENGL202C, MATH140, MATH141, CHEM110, PHYS211, EDSGN100.

The following courses require C or better for graduation in chemical engineering:

CHE **210, 220**, 320, 330, 350

CHE **210 and 220** are special courses and require a minimum grade of C before you can take **any CHE course** that has these courses as prerequisites. Notice that CHE 210 is a prerequisite for all 300-level courses (except CHE 300); this means that a D in 210 will require you to retake 210 before you can start taking 300-level courses.

General Scheduling Tips

- During the semester you take CHE 210 and 220, plan on a lighter credit load (~15-16 credits), especially if you are transferring from a Commonwealth Campus. It takes some effort to get used to the format and study style of chemical engineering classes and since both CHE 210 and 220 require a minimum grade of C, you should make sure you have the time to devote the required effort.
- The 300-level courses can be taken almost in any sequence. We recommend that you take CHE 320 and 330 in the fall of the junior year, then CHE 300, 350 and 340 in the spring. It is highly recommended to take CHE 330 before taking CHE 350.
- CHE 410 and 430 are prerequisites for CHE 470. A typical plan is to take 410 and 430 in the fall of the senior year, and 470 in the spring.
- The chemical engineering lab, CHE 480W, can be taken concurrently with CHE 410/430, therefore you can take it either in the fall or spring of the senior year. It is not recommended to take both 410 and 430 concurrently with the lab.
- All required CHE courses are offered both fall and spring, except for CHE 300 (spring only).

Sample course plans are shown on the next pages. Though these are typical plans, there are many possible progressions through the curriculum. It is your responsibility to ensure that the courses you want to take are available in the semester you plan to take them, and that all prerequisites are satisfied. Before making modifications to this plan see your advisor to make sure that everything will work as planned.

RECOMMENDED CHE SCHEDULE (WITH PRE-REQUISITES IN PARATHESSES)

Semester 1	credits	Semester 2	credits
MATH 140	4	MATH 141	4
CHEM 110	3	CHEM 112	3
CHEM 111	1	CHEM 113	1
EDSGN 100 or ENGL 15	3	PHYS 211	4
First year seminar	1	EDSGN 100 or ENGL 15	3
ECON 102 or 104 (GS)	3	Gen Ed 2	3
	15		18
Semester 3	credits	Semester 4	credits
CHE 210 *	3	CHE 300	1
MATH 251	4	CHE 220	3
CHEM 210	3	CHE 230	1
PHYS 212	4	CHEM 212	3
Gen Ed 3	3	MATH 231*	2
		Science Elective	3
		Gen Ed 4	3
	16		16
Semester 5	credits	Semester 6	credits
CHE 320 (210, 220, MATH 231)	3	CHE 350 (210, 230, MATH 251)	3
CHE 330 (210, MATH 251)	3	CHE 340 (210, MATH 251, CHEM 212)	3
CHEM 213W	2	Science or Engineering Elective	3
Professional Elective	3	Lab Experience	2
Gen Ed 5	3	CAS 100 A/B	3
Gen Ed 6	3	Health and Wellness (GHW)	1.5
	16		15.5
Semester 7	credits	Semester 8	credits
CHE 410 (230, 320, 330, 350)	3	CHE 470 (350, 410, 430)	3
CHE 430 (320)	3	CHE 480W (230, 320, 330, 350)	3
CHE 452 (320)	3	Chemical Engineering Elective	3
ENGL 202C	3	Engineering Elective	3
Engineering Elective	3	Professional Elective	3
Chemical Engineering Elective	3	Health and Wellness (GHW)	1.5
	18		16.5



ROBERT V. WALTERMEYER DEPARTMENT OF CHEMICAL ENGINEERING

Advising notes for Chemical Engineering students

1 st Year		2 nd Year		3 rd Year		4 th Year	
MATH 140 4 credits	MATH 141 4 credits (MATH 140)	CHE 210 (MATH 141, CHEM 112)	CHE 220 (MATH 141, CHEM 112)	CHE 320 (CHE 210, CHE 230, MATH 251)	CHE 350 (CHE 210, CHE 230, MATH 251)	CHE 430 (CHE 330)	CHE 470 (CHE 350, CHE 430, CHE 430)
EDSGN 100	PHYS 211 4 credits (co-MATH 140)	MATH 251 4 credits (MATH 141)	MATH 231 2 credits (MATH 141)	CHE 330 (CHE 210, MATH 251)	CHE 340 (CHE 210, CHEM 212, MATH 251)	CHE 410 (CHE 230, CHE 330, CHE 330 or CHE 350)	CHE 480W (230, 320, 330, 350, co-410)
CHEM 110	CHEM 112 (CHEM 110)	PHYS 212 4 credits (PHYS 211, co-MATH 141)	CHE 230 1 credit (MATH 251)	CHEM 213W 2 credits (CHEM 210, co-CHEM 212)		CHE 452 (CHE 320, co-CHE 330, CHE 350)	CHE 4XX
CHEM 111 1 credit (co-CHEM 110)	CHEM 113 1 credit (co-CHEM 112)	CHEM 210 (CHEM 112)	CHEM 212 (CHEM 210)			CHE 4XX	
ECON 102 or 104 [GS]	ENGL 15 [GWS]		CHE 300 2 credits (CHE 230) Spring ONLY				
CHE 100 or First-Year Seminar							

Gen Ed- General Exploration	SCIENCE ELECTIVE	SCIENCE or ENGINEERING ELECTIVE	PROFESSIONAL ELECTIVE	PROFESSIONAL ELECTIVE
Gen Ed- Interdomain [N]	Gen Ed- Interdomain [N]	Gen Ed [GH]	ENGL 202C [GWS]	ENGINEERING ELECTIVE
Gen Ed 3 credits [GWW]	Gen Ed [GA]	CAS 100A/B [GWS]	LAB ELECTIVE 2 credits	ENGINEERING ELECTIVE

Engineering Electives	Science Electives	Lab Electives

-Courses are Entrance to Major (C or better)
 -CHE Courses required with a C or better
 -CHE Courses required with a C or better to move on
 -CHE Courses (Pre-requisites are shown in parentheses)
 -Courses within the dotted box can be taken in any order...

LIST OF ENGINEERING, SCIENCE and LAB ELECTIVES

Courses listed below are approved to count as Engineering and Science Electives as well as lab experiences within the Chemical Engineering Major. Many of these courses have enrollment controlled by the department offering the course, and the availability of seats in these courses may vary from semester to semester. Many of the courses in the list below require prerequisites that are outside the courses normally taken by chemical engineering students. It is the student's responsibility to ensure that he or she has the proper prerequisites for the course of their choice. For some courses, students may find they can substitute a CHE course for a pre-req required in other departments (for example, an advanced ME course might list a ME Thermodynamics pre-req, but CHE 220/320 may also be acceptable). Questions about prerequisites should be directed to the department or instructor that offers the course of interest.

Most common Engineering Electives (prerequisites in parentheses)

BIOMEDICAL ENGINEERING

BME 410 BIOMEDICAL APPLICATIONS OF MICROFLUIDICS (CHE 330)
BME 413 MASS TRANSPORT IN BIOLOGICAL SYSTEMS (CHE 220, MATH 251, BIOL 141 OR 240W)
BME 419 ARTIFICIAL ORGANS AND PROSTHETIC DEVICES (BIOL 141 OR BIOL 240W, CMPSC 200 OR 201 OR 121)
BME 423 REACTION KINETICS OF BIOLOGICAL SYSTEMS (BIOL 141 OR BIOL 240W, MATH 251, CHE 210, CHE 410)
BME 437 BIOMEDICAL DATA SCIENCE FOR BIOENGINEERS
BME 445 TISSUE ENGINEERING: CONCEPTS, CALCULATIONS AND APPLICATIONS (BMB 251)
BME 446 POLYMERS IN BIOMEDICAL ENGINEERING (EMCH 210)

CIVIL ENGINEERING

CE 370 INTRODUCTION TO ENVIRONMENTAL ENGINEERING (3) (MUST BE IN ENV. ENG MINOR)
CE 475: WATER QUALITY CHEMISTRY (3) (CE 370)
CE 476: SOLID AND HAZARDOUS WASTES (3) (CE 370)
CE 479: ENVIRONMENTAL MICROBIOLOGY FOR ENGINEERS (3) (CE 370)

COMPUTER SCIENCE

CMPSC 121 INTRODUCTION TO PROGRAMMING TECHNIQUES (3)
CMPSC 131 PROGRAMMING AND COMPUTATION 1: FUNDAMENTALS (3)

CMPSC 204 INTRODUCTION TO COMPUTATIONAL SCIENCES PROGRAMMING (3)
CMPSC 205 INTERMEDIATE COMPUTATIONAL SCIENCES PROGRAMMING (3) (CMPSC 204)

ENGINEERING MECHANICS

EMCH 210: STATICS AND STRENGTH OF MATERIALS
EMCH 211 STATICS (3) (MATH 140)
EMCH 212: DYNAMICS (EMCH 210 OR EMCH 211)

MATERIAL SCIENCE AND ENGINEERING

MATSE 403/ BME 443 BIOMEDICAL MATERIALS (3) (MATSE 201, MATH 231)

MATSE 404/ BME 444 SURFACES AND THE BIOLOGICAL RESPONSE TO MATERIALS
 MATSE 445 THERMODYNAMICS, MICROSTRUCTURE, AND CHARACTERISTICS OF POLYMERS (MATSE 202)
 MATSE 446 MECHANICAL AND ELECTRICAL PROPERTIES OF POLYMERS AND COMPOSITES (MATSE 202)

ENERGY AND GEO-ENVIRONMENTAL ENGINEERING

EGEE 420 HYDROGEN AND FUEL CELLS (3) (EME 301 OR CHE 210 WITH WAIVER)
 EGEE 441 ELECTROCHEMICAL ENGINEERING FUNDAMENTALS (3) (CHE 220 AND CHE 330)
 EGEE 455 MATERIALS FOR ENERGY APPLICATIONS (3) (EGEE 302 OR CHE 220 WITH WAIVER, MATSE 201)
 EGEE 439 ALTERNATIVE FUELS FROM BIOMASS SOURCES (3)

ENVIRONMENTAL SYSTEMS ENGINEERING

ENVSE 400 ENVIRONMENTAL SYSTEMS ENGINEERING (3)
 ENVSE 450 ENVIRONMENTAL HEALTH AND SAFETY (3)
 ENVSE 470 ENGINEERING RISK ANALYSIS (3) (MATH 251)

FUEL SCIENCE

FSC 431 CHEMISTRY OF FUELS (3) (CHEM 210 AND EGEE 302/CHE 220 WITH WAIVER)
 FSC 432 PETROLEUM PROCESSING (3) (CHEM 210)

Approved Engineering and Science Electives and Lab Experiences

Note that students can only take CMPSC 121, 131*, 200*, 201*

Engineering Electives		Science Electives		Lab experiences	
BE	302, 304, 308, 465, 468	BIOL	141, 161, 230W, 322	CHEM	457
BME	409, 410, 419, 423, 443, 444	BME	201	BIOL	230W, 142, 162, 164
CE	370, 371	BMB	251, 252, 401, 402	MICRB	202
CMPSC	121*, 131*	CHEM	227, 301, 310,	BMB	442, 445W
	200*, 201*, 202, 204, 205, 301, 348		402, 404, 406, 410, 448, 452, 464, 466, 476, 480		
EBF	473, 484	IST	230	MATSE	460, 462
EE	210, 211, 212	MATH	220, 230 (2 cr), 232, 310, 414	CE	475, 479
EGEE	302, 401, 411, 412, 420, 430, 436, 437, 441, 451, 464, 411	MICRB	201	CHEM	423W, 425W
EMCH	211, 212, 213	PHYS	213, 214, 237		
ENGR	408	STAT	200, 250, 318, 401		

Curriculum in this handbook directly applies to students who enter the CHE major

ENVSE	400, 420, 450, 457, 470		
ESC	312, 313, 314		
FSC	401, 431		
	201, 202, 259, 400, 401, 402, 403, 404, 409, 441, 443, 444, 445, 446, 447, 460, 462		
MATSE	401, 402, 403, 405, 406, 430, 433		
ME			
NUCE	406, 409		
PNG	410, 480		

Academic Integrity

Professional integrity will be important to your career as a Chemical Engineer, as acting with integrity is essential to being an effective team member in the workplace. Surveys consistently show that people select co-workers who they perceive as having high integrity, and a large percentage of disciplinary issues in the workplace (including firing) occur due to integrity violations. Academic integrity is your chance to practice acting with integrity while you are a student. Our instructors and students both have a responsibility to act with integrity to create a positive and professional learning environment. As a student, acting with integrity includes:

Coming prepared for class

Treating your peers and instructors with respect

Handing in assignments on time that honestly represent your work

Coming to exams prepared and demonstrating your knowledge and abilities on exams

Any violations of academic integrity will follow university procedures to record violations and enact sanctions. Please know that sanctions cannot be enacted without going through the College of Engineering. Please see your advisor or the department head if you feel you have been unfairly accused of an academic integrity violation without going through the proper channels. You can learn more about academic integrity policies and the procedures for violations at this website:

<https://advising.engr.psu.edu/student-resources/academic-integrity.aspx>

Substitutions and Recording Elective Choices

All requests to make substitutions for required courses are to be submitted through the coursesub.psu.edu system. Some Professional Elective choices need to be submitted through this system to have the course recorded in LionPATH as your choice as a Professional Elective. Many Professional Electives, and most Chemical Engineering and Engineering Electives are automatically moved to count towards these requirements in your LionPATH record. If a course is not appearing in the correct location on your “Academic Requirements” (also known as “degree audit”) record in LionPATH, you should submit a petition to have the course moved through the coursesub system. Typical petitions include:

- **FYS:** Substituting any 1 credit course toward the FYS credit if you already received credit for a FYS. You may have received this credit from ENGL137 or 138 (from SHC) or EDSGN from another campus.
- **MATH230 for MATH231:** If you took MATH 230 (4 credits), you can petition this to count as MATH231 (2 credits) plus 2 credits of professional elective. No explanation necessary.
- **MATH250 + MATH252 for MATH251:** You can petition MATH250 (3 credits) + MATH251 (1 credit) for MATH251. No explanation necessary.
- **Professional elective:** Counting a 200-level course or above for a professional elective. Please provide a description of how this course contributed to your development as a student and/or as a professional.
- **Engineering elective:** Counting a technical course for an engineering elective. This could include your internship/co-op credit. Note that you get one credit for each semester of an internship/coop. You must describe how this course fits the following description of an engineering sciences course:

Engineering sciences are based on mathematics and basic sciences but carry knowledge further toward creative application needed to solve engineering problems. These studies provide a

bridge between mathematics and basic sciences on the one hand and engineering practice on the other.

- **General Education courses:** You may want to petition a course that you took to count as a GA, GH, GS, GHW, IL, US or ID. These requests will go to the Dean's office in the College of Engineering. When making these requests please do the following:
 - o Attach the syllabus of the course.
 - o Describe how the course meets the requirements as found here for Knowledge Domains (GA, GH, GS): <https://bulletins.psu.edu/undergraduate/general-education/domains/>
 - o Here for interdomains (ID): <https://bulletins.psu.edu/undergraduate/general-education/integrative-studies/>
 - o Here for FYS, US, IL and GWS: <https://bulletins.psu.edu/undergraduate/general-education/other-university-requirements/>
 - o Be as specific as possible and include the assignments that satisfied the learning objectives.

General Education Requirements

The "General Education" requirements of Baccalaureate degrees at Penn State are most clearly conveyed at the university's bulletin website:

<http://undergraduate.bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>

Advising

CHE majors are assigned a faculty member from our advising team as their faculty adviser. You will receive a chemical engineering advisor once you have declared the major AND are enrolled in CHE 210. Students can schedule appointments with their adviser in Starfish at: <http://starfish.psu.edu/>. Find your advisor under "my success network". Schreyer Honors students will need to email their advisor for an appointment. Advisers can serve as your primary resource for any academic questions that arise, including course scheduling, study habits, career planning, and integrating courses and extracurricular activities. Students can meet with their adviser to address specific issues (scheduling next semester's classes, developing a plan of study for the next few semesters, getting advice on struggles in their courses, planning study abroad or a co-op) or for a general "check-up" on their academic progress and plans. We suggest that students check in with their adviser each semester.

Transferring courses from other universities towards the major

Students are permitted to transfer courses from other universities towards their graduation requirements at PSU. The following website provides information on how courses are transferred to PSU:

<https://admissions.psu.edu/info/future/transfer/credit/> Note that a "Transfer Tool" is linked on this website where students can find specific courses at other universities and their PSU equivalence.

In many cases, CHE courses of interest to students at other universities will not be listed as a direct-equivalent. Students often would like to know if a CHE course at another university can count towards a specific CHE major requirement before enrolling in the course (including when studying abroad).

Students are encouraged to email the undergraduate program coordinator, Stephanie Velegol (sbv1@psu.edu) if they would like to know whether a specific course at another university can be used to count towards a CHE course requirement. In the email, students should specify the university where the course is to be taken, attach the syllabus for the course, and note what PSU CHE course they are hoping

to replace. Such requests cannot typically be evaluated without a syllabus, so students should contact the other university to request a syllabus before emailing.

For non-CHE courses, students will need to contact the specific department that offers the related PSU course for any pre-evaluation of equivalence.

Repeating courses

University policy limits the number of times a student can repeat a course, limiting students to *two attempts*. Both receiving a failing grade (including D in a “C or better” course) or late dropping a course count as an attempt. Students can request a third attempt by completing the form:

https://www.engr.psu.edu/arws/secured/form.aspx?form_id=7

A third attempt will generally be approved if the student can provide a justification as to what will be done differently to allow for success on the third attempt. Though this form can also be used to request a fourth attempt at a class, fourth attempts are only approved under extreme circumstances.

Grade Replacement

Beginning in Summer 2020, if a student earns a D or F grade in a course and then repeats the course and earns a better grade, the student can replace the D or F with the new grade. If this grade forgiveness is granted, both grades will appear on the transcript but only the higher grade will contribute to the student’s GPA. You can only use this for up to 12 credits. You can request this grade forgiveness after you have completed the second course on LionPATH under Academic Records. See more:

https://pennstate.servicenow.com/kb?id=kb_article_view&sysparm_article=KB0019564&sys_kb_id=5fe33ce2873321d09b7d7484dabb350f&spa=1

Extra-Curricular Activities

AIChE Undergraduate Student Chapter

Our department has a very active and vigorous student chapter of the American Institute of Chemical Engineers. This chapter organizes academic, social, and career-oriented activities to help students integrate into the department and the profession. Activities include networking sessions with companies, outreach activities to educate K-12 students about science and engineering, intramural sports teams, a graduation celebration, and the Penn State THON fundraiser. Students can begin involvement at any time during their studies, including during their first semester at PSU. For more information, visit: <http://sites.psu.edu/aiche/>

Omega Chi Epsilon (Beta Alpha Student Chapter)

Omega Chi Epsilon (OXE) is the national honor society for the Chemical Engineering field. Students become eligible for induction to the chapter following completion of 6 credits (typically, CHE 210 and CHE 220) in Chemical Engineering and must have a 3.5 GPA or higher at the time of induction. Students are also asked to participate in service activities prior to induction. The main service activity OXE participates in is providing tutoring to students in the 2xx and 3xx CHE courses. OXE also holds luncheon meetings with faculty to learn about research and other academic issues, holds resume workshops, and participate in high school outreach. For more information, please visit: <https://sites.google.com/a/psu.edu/oxe/home>

Internships/CO-OPs <https://career.engr.psu.edu/students/intern-coop/index.aspx>

Chemical Engineering undergraduate students participate in paid internships (during the summer) and CO-OPs (during the academic year) with companies in the field. These experiences provide a great chance to learn about possible career paths and build experience that helps make students competitive for job opportunities following graduation. In our 2023 exit surveys, 94% of CHE majors reported participating in a paid industrial internship or CO-OP while an undergraduate in our program. Students are encouraged to discuss career options with their advisors and CHE professors, and to attend company information sessions. Career Fairs are held in fall and spring semesters, and students are encouraged to attend these beginning during their first year to help learn about opportunities and build relationships with possible future employers. For CHE-specific questions about CO-OPs and internships, students are referred to Professor Gary Aurand, our department's co-op officer (gza140@psu.edu). We also recommend that you meet with a College of Engineering Career Envoy to answer questions about your resume, cover letters, interviews, and professionalism. <https://career.engr.psu.edu/students/envoys.aspx>

College of Engineering career fair: <https://career.engr.psu.edu/calendar.aspx>

Penn State career fair: <https://studentaffairs.psu.edu/career/fairs>

If students register for the ENGR 195/295/395 CO-OP/internship courses, these can count as a Professional Elective in the CHE major. If the experience has sufficient technical content, it can be used as an Engineering Elective. Students wanting this to count as an Engineering Elective should submit a petition on coursesub.psu.edu and include their final report, explaining the technical content of the experience, as an attachment.

Undergraduate Research

There are many opportunities in the CHE department for undergraduate students to get involved in research activities. Students pursuing honors in Chemical Engineering are typically involved in research over multiple semesters and complete a thesis. Though there are many Schreyer Honor's students pursuing research in the department, research is not restricted to honors students. On our 2023 graduation surveys, 48% of all CHE BS students reported getting involved in research during their undergraduate careers. Students can complete research for credit (CHE 294 or CHE 494) during the school year. There are also opportunities through department endowments and National Science Foundation sponsorship to get paid to do research during the summer.

To get involved in research, students are encouraged to peruse the research descriptions of faculty on our department website and contact (email, or in person) faculty that lead groups with research in an area of interest. Students should get an agreement from a faculty member to perform research for credit before registering for CHE 294(H) or 494(H).

Student support

Counseling and Psychological Services (CAPS)

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

[Counseling and Psychological Services at University Park \(CAPS\)](#): 814-863-0395

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400

Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

Career Resources & Employer Relations

We are fortunate to have our own career office in the College of Engineering. There are many resources there to help you find career opportunities including preparing for the career fair and helping with your resume. You can also meet with a career envoy here:

<https://career.engr.psu.edu/students/envoys.aspx#hours>

Center for Global Engineering Engagement

The Penn State Center for Global Engagement <https://global.engr.psu.edu/> can help you find international experiences as an engineering student. They have Global Engineering Fellows (other undergraduate students who have had an international experience) that you can meet with to help you on your journey here: <https://global.engr.psu.edu/global-engineering-fellows/meet-with-a-fellow.aspx>

Engineering Peer Advising Leaders (EPALS)

EPALS are a cohort of College of Engineering students who can help you with technical and advising support. You can find out more about them here: <https://advising.engr.psu.edu/advising/epals.aspx>

Academic Excellence Center (AEC)

The AEC offers an educational space for one-on-one and group tutoring free of charge. The AEC is located in 004 Engineering Collaborative Research and Education (ECoRE) Building, and the hours of operation during the academic year are Sunday, 2:00 to 9:00 p.m., Monday through Thursday, 5:00 to 10:00 p.m., and Friday 4:00 to 8:00 p.m. <https://inclusion.engr.psu.edu/student-programs/student-success-programs/academic-excellence-center.aspx>