

CHEMICAL AND BIOMOLECULAR ENGINEERING, BSE

Chemical Engineers apply concepts from the physical sciences (chemistry and physics) and life sciences (biochemistry and microbiology) to the design and optimization of processes for the efficient production of products ranging from fuels and chemicals to pharmaceuticals to advanced materials. Penn's chemical engineering department provides students with both a strong foundation in engineering fundamentals and exposure to modern chemical engineering technologies. The program's versatility allows our students to excel in diverse careers in the chemical industries, research, medicine, law, government, and education.

For more information: <https://www.seas.upenn.edu/prospective-students/undergrad/majors/chemical-and-biomolecular-engineering/>

Chemical and Biomolecular Engineering (CBE) Major Requirements

37 course units are required.

Code	Title	Course Units
Engineering		
ENGR 1050	Introduction to Scientific Computing	1
CBE 1600	Introduction to Chemical Engineering	1
CBE 2300	Material and Energy Balances of Chemical Processes	1
CBE 2310	Thermodynamics of Fluids	1
CBE 3500	Fluid Mechanics	1
CBE 3510	Heat and Mass Transport	1
CBE 3530	Molecular Thermodynamics and Chemical Kinetics	1
CBE 3600	Chemical Process Control	1
CBE 3710	Separation Processes	1
CBE 4000	Introduction to Product and Process Design	1
CBE 4100	Chemical Engineering Laboratory	1
CBE 4510	Chemical Reactor Design	1
CBE 4590	Product and Process Design Projects	1
Math and Natural Science		
MATH 1400	Calculus, Part I	1
MATH 1410	Calculus, Part II	1
MATH 2400	Calculus, Part III	1
MATH 2410	Calculus, Part IV	1
or ENM 2510	Analytical Methods for Engineering	
PHYS 0140	Principles of Physics I (without laboratory)	1
1		
or PHYS 0150	Principles of Physics I: Mechanics and Wave Motion	
or PHYS 0170	Honors Physics I: Mechanics and Wave Motion	
or MEAM 1100	Introduction to Mechanics	

PHYS 0141	Principles of Physics II (without laboratory)	1
1		
or PHYS 0151	Principles of Physics II: Electromagnetism and Radiation	
or PHYS 0171	Honors Physics II: Electromagnetism and Radiation	
or ESE 1120	Engineering Electromagnetics	
CHEM 1012	General Chemistry I	1
CHEM 1101	General Chemistry Laboratory I	0.5
CHEM 1022	General Chemistry II	1
CHEM 1102	General Chemistry Laboratory II	0.5
CHEM 2210	Physical Chemistry I	1
or MSE 2210	Quantum Physics of Materials	
CHEM 2410	Principles of Organic Chemistry I	1
or CHEM 2411	Principles of Organic Chemistry I with Laboratory	
CHEM 2420	Principles of Organic Chemistry II	1
or CHEM 2421	Principles of Organic Chemistry II with Laboratory	
or CHEM 2425	Organic Chemistry II: Principles of Organic Chemistry with applications in Chemical Biology	
or CHEM 2510	Principles of Biological Chemistry	
Technical Electives ³		
CBE Elective (3000 level or above)		1
Engineering		1
CHEM 2412	Principles of Organic Chemistry I	1
& CHEM 2422	Laboratory and Principles of Organic Chemistry II Laboratory ²	
or CHEM 2230	Experimental Physical Chemistry I	
or CBE 4800	Laboratory in Biotechnology and Biochemical Engineering	
Select 2 Math, Natural Science or Engineering courses		2
General Electives ³		
EAS 2030	Engineering Ethics	1
Select 4 Social Science or Humanities courses		4
Select 2 Social Science or Humanities or Technology in Business and Society courses		2
Total Course Units		37

¹ One less Technical Elective required if PHYS 0150 Principles of Physics I: Mechanics and Wave Motion/PHYS 0151 Principles of Physics II: Electromagnetism and Radiation taken.

² CBE Majors taking the Organic Chemistry Lab sequence to satisfy the Lab Tech Elective requirement must take CHEM 2411, CHEM 2421 (Advanced Chemistry Elective) and CHEM 2412 and CHEM 2422, the two affiliated .5 CU lab sections.

³ Must include a Writing Seminar (a list of approved Writing Seminars can be found in the SEAS Undergraduate Handbook (<https://ugrad.seas.upenn.edu/student-handbook/courses-requirements/writing-courses/>))

Concentrations

Students can select one of the following concentrations:

- Energy and the Environment
- Pharmaceuticals and Biotechnology
- Polymers and Soft Matter Science and Engineering

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2023 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.
