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-bimolecular-engineering/

Chemical and Biomolecular Engineering (CBE) Major Requirements

41 course units are required. Read more about the Undergraduate Student Handbook (http://www.seas.upenn.edu/undergraduate/handbook).

Code	Title	Course Units
Engineering		
ENGR 105	Introduction to Scientific Computing	1
CBE 160	Introduction to Chemical Engineering	1
CBE 230	Material and Energy Balances of Chemical Processes	1
CBE 231	Thermodynamics of Fluids	1
CBE 350	Fluid Mechanics	1
CBE 351	Heat and Mass Transport	1
CBE 353	Advanced Chemical Engineering Science	1
CBE 371	Separation Processes	1
CBE 400	Introduction to Product and Process Design	1
CBE 410	Chemical Engineering Laboratory	1
CBE 451	Chemical Reactor Design	1
CBE 459	Product and Process Design Projects	1
CBE 460	Chemical Process Control	1
CBE Elective [1]		2
Math		
MATH 104	Calculus, Part I	1
MATH 114	Calculus, Part II	1
MATH 240	Calculus, Part III	1
MATH 241	Calculus, Part IV	1
Natural Science		
PHYS 140	Principles of Physics I (without laboratory) [2]	1
or PHYS 150	Principles of Physics I: Mechanics and Wave Motion	
PHYS 141	Principles of Physics II (without laboratory) [2]	1
or PHYS 151	Principles of Physics II: Electromagnetism and Radiation	
CHEM 101	General Chemistry I	1
CHEM 053	General Chemistry Laboratory I	0.5
CHEM 102	General Chemistry II	1
CHEM 054	General Chemistry Laboratory II	0.5
CHEM 221	Physical Chemistry I	1
or MSE 221	Quantum Physics of Materials	
CHEM 241	Principles of Organic Chemistry	1
CHEM 242	Principles of Organic Chemistry II	1
or CHEM 251	Principles of Biological Chemistry	
Technical Electives [3]		
Select 1 Engineering elective		1
Select 2 Technical Electives		2
Select one of the following:		1
CBE 480	Laboratory in Biotechnology and Genetic Engineering	
CHEM 223	Experimental Physical Chemistry I	
CHEM 245	Experimental Organic Chemistry	
Social Sciences and Humanities [4]		
Select 2 Social Science courses		2
Select 2 Humanities courses		2
Select 1 Social Science or Humanities course		1
Select 2 Social Science or Humanities or Technology in Business and Society courses		2
Free Elective		
Select 3 course units of free electives		3
Total Course Units		41

1. Must be upper level CBE course, 300 or higher, or ENM 510 Foundations of Engineering Mathematics - I, ENM 511 Foundations of Engineering Mathematics - II.
2. One less Technical Elective required if PHYS 150 Principles of Physics I: Mechanics and Wave Motion/PHYS 151 Principles of Physics II: Electromagnetism and Radiation taken.
3. CBE 150 Introduction to Biotechnology recommended.
4. The Social Science & Humanities Depth and Writing requirements can be satisfied with the 7 total course units.

Concentrations

Students may select one of four concentrations (http://www.cbe.seas.upenn.edu/current-students/undergraduates/concentrations.php):

- Pharmaceutics and Biotechnology
- Polymer Science and Engineering
- Nanotechnology
- Environmental Engineering

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2018 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.