

Chemical Engineering, B.S.Ch.E.

Degree Offered

- Bachelor of Science in Chemical Engineering (B.S.Ch.E.)

Nature of the Program

The chemical engineering curriculum is designed to give graduates a broad background in chemical engineering processes and to prepare them to become practicing engineers. Graduates are prepared for positions in operations, development, design, construction, and management of chemical plants, environmental processes, life sciences, and materials processing. These industries convert raw materials, such as ethylene and other organic feedstocks, via chemical and physical changes to produce economically desirable products such as plastics, detergents, paints, and adhesives. Students with this background are also prepared for graduate school in engineering and science as well as for any professional school. The Bachelor of Science degree in Chemical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, under the General Criteria and the Program Criteria for Chemical, Biochemical, Biomolecular Engineering.

Program Educational Objectives

- Graduates will be successful in their professional careers and/or post graduate training as demonstrated by their identification and subsequent solution of problems, development of new and valuable ideas, pursuit of continual professional development, and application of chemical engineering and related skills to new challenges.
- Graduates will be able to succeed in diverse professional environments, working effectively in multifunctional teams and independently, providing leadership, and communicating effectively.
- Graduates will demonstrate professional character exhibited by their ethical behavior, their commitment to responsible safety practices, and their dedication to maintain accountability for the global, societal, and environmental impact of their work.

Click here to view the Suggested Plan of Study (p. 6)

Curriculum in Chemical Engineering

General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef/>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

Code	Title	Hours
General Education Foundations		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Reasoning		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)		9
Total Hours		31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Degree Requirements

Students must meet the following criteria to qualify for a Bachelor of Science in Chemical Engineering degree:

- Complete a minimum of 128 credit hours
- Satisfy WVU's undergraduate degree requirements

- Satisfy Statler College's undergraduate degree requirements (<http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/#policies>)
- Complete all courses listed in the curriculum requirements with the required minimum grades
- Attain an overall grade point average of 2.00 or better
- Attain a WVU grade point average of 2.00 or better
- Attain a Statler grade point average of 2.00 or better
- A maximum of one math or science course with a grade of D+, D, or D- may apply towards a Statler College degree
- Complete a survey regarding their academic and professional experiences at WVU, as well as post-graduation job placement or continuing education plans.

The Statler GPA is computed based on all work taken at WVU with a subject code within Statler College (BIOM, BMEG, CE, CHE, CPE, CS, CSEE, CYBE, EE, ENGR, ENVE, ETEC, IENG, IH&S, MAE, MINE, PDA, PNGE, SAFM, SENG) excluding ENGR 140, ENGR 150, and CS 101. The WVU GPA is computed based on all work taken at WVU. The Overall GPA is computed based on all work taken at WVU and transfer work.

Curriculum Requirements

Code	Title	Hours
	University Requirements	19
	Fundamentals of Engineering Requirements	5
	Math and Science Requirements	36
	Chemical Engineering Program Requirements	68
	Total Hours	128

University Requirements

Code	Title	Hours
	General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)	
	Outstanding GEF Requirements 1, 4, 5, 6, and 7	18
ENGR 191	First-Year Seminar	1
	Total Hours	19

Fundamentals of Engineering Requirements

Code	Title	Hours
	A minimum grade of C- is required in all Fundamentals of Engineering courses.	
ENGR 101	Engineering Problem Solving 1	2
	Engineering Problem Solving (Select one of the following):	3
CHE 102	Introduction to Chemical Engineering	
ENGR 102	Engineering Problem Solving 2	
MAE 102	Introduction to Mechanical and Aerospace Engineering Design	
	Total Hours	5

Math and Science Requirements

Code	Title	Hours
	A minimum grade of C- is required in all Math and Science courses.	
	First Year Chemistry (GEF 2B):	8
CHEM 115 & 115L & CHEM 116 & CHEM 116L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory and Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	
CHEM 233 & 233L	Organic Chemistry 1 and Organic Chemistry 1 Laboratory	4
MATH 155	Calculus 1 (GEF 3)	4
MATH 156	Calculus 2 (GEF 8)	4
MATH 251	Multivariable Calculus	4
MATH 261	Elementary Differential Equations	4

Physics:

PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (GEF 8)	4
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory (GEF 8)	4
Total Hours		36

Chemical Engineering Major Requirements

Code	Title	Hours
CHE 221	Material and Energy Balance	4
CHE 230	Numerical Methods for Chemical Engineering	3
CHE 321	Chemical Engineering Thermodynamics and Kinetics	4
CHE 322	Unit Operations 1	4
CHE 323	Unit Operations 2	4
CHE 315	Chemical Engineering Transport Analysis	3
CHE 325	Chemical Reaction Engineering	3
CHE 351L	Chemical Process Laboratory	2
CHE 355	Process Simulation and Design	3
CHE 435	Chemical Process Control	3
CHE 452L	Chemical Engineering Senior Laboratory	2
CHE 452S	Chemical Engineering Senior Laboratory Analysis	1
CHE 455 & 455S	Chemical Process Design 1 and Chemical Process Design 1 Studio	4
CHE 456S	Chemical Process Design 2	3
CHE 475	Chemical Process Safety	3
Technical Electives		
Engineering Science Electives		6
Advanced Science Electives		7
Advanced Chemistry Elective (3hrs)		
Life Science Elective (4hrs)		
Other Technical Electives		9
Total Hours		68

TECHNICAL ELECTIVES

Code	Title	Hours
Engineering Science Electives		6
BMEG 201	Introduction to Biomedical Engineering	
BMEG 311	Biomaterials	
BMEG 480	Cellular Machinery	
BMEG 481	Applied Bio-Molecular Modeling	
BMEG 482	Introduction to Tissue Engineering	
CE 310	Civil Engineering Materials	
CE 332	Introduction to Transportation Engineering	
CE 347 & 347L	Introduction to Environmental Engineering and Introduction to Environmental Engineering Laboratory	
CE 351 & 351L	Introductory Soil Mechanics and Introductory Soil Mechanics Laboratory	
CHE 414	Coal Conversion Engineering	
CHE 461	Polymer Science and Engineering	
CHE 462	Polymer Processing	
CHE 463	Polymer Composites Processing	
CHE 466	Electronic Materials Processing	

CHE 471	Biochemical Engineering
CHE 472	Biochemical Separations
CHE 476	Pollution Prevention
CHE 495	Independent Study
CHE 496	Senior Thesis
CHE 498	Honors
CPE 271 & 271L	Introduction to Digital Logic Design and Digital Logic Laboratory
EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory
EE 223 & 223L	Electrical Circuits and Electrical Circuits Laboratory
IENG 213	Engineering Statistics *Completion of IENG 213 and STAT 215 will not fulfill two elective requirements.
IENG 220 & 220L	Re-Engineering Management Systems and Re-Engineering Management Systems Laboratory
IENG 377	Engineering Economy
IENG 461	System Safety Engineering
MAE 211 & 211L	Mechatronics and Mechatronics Laboratory
MAE 215	Introduction to Aerospace Engineering
MAE 241	Statics
MAE 242	Dynamics
MAE 243	Mechanics of Materials
MAE 244L	Dynamics and Strength Laboratory
MAE 425	Internal Combustion Engines
MAE 473	Bioengineering
MSEN 350	Materials Science
PNGE 200	Introduction to Petroleum Engineering
Advanced Chemistry Electives	
3	
AGBI 410 & 410L	Introductory Biochemistry and Introduction to Biochemistry Laboratory
AGBI 512	Nutritional Biochemistry
BMM 339	Introduction to Human Biochemistry
BMEG 311	Biomaterials
BMEG 480	Cellular Machinery
BMEG 481	Applied Bio-Molecular Modeling
BMEG 482	Introduction to Tissue Engineering
CHE 466	Electronic Materials Processing
CHEM 215 & 215L	Introductory Analytical Chemistry and Introductory Analytical Chemistry Laboratory
CHEM 234 & 234L	Organic Chemistry 2 and Organic Chemistry 2 Laboratory
CHEM 310 & 310L	Instrumental Analysis and Instrumental Analysis Laboratory
CHEM 312	Environmental Chemistry
CHEM 348 & 348L	Physical Chemistry 2 and Physical Chemistry 2 Laboratory
MSEN 350	Materials Science
Life Sciences Electives	
4	
AEM 341 & 341L	General Microbiology and General Microbiology Laboratory
AEM 401 & 401L	Environmental Microbiology and Environmental Microbiology Laboratory

BIOL 101 & 101L & BIOL 102 & BIOL 102L	General Biology 1 and General Biology 1 Laboratory and General Biology 2 and General Biology 2 Laboratory
BIOL 115 & 115L	Principles of Biology and Principles of Biology Laboratory
BIOL 117 & 117L	Introductory Physiology and Introductory Physiology Laboratory
BIOL 235	Human Physiology
GEN 371 & 371L	Principles of Genetics and Principles of Genetics Laboratory
PSIO 241	Elementary Physiology
Other Technical Electives	9
AEM 341 & 341L	General Microbiology and General Microbiology Laboratory
AEM 401 & 401L	Environmental Microbiology and Environmental Microbiology Laboratory
AGBI 410 & 410L	Introductory Biochemistry and Introduction to Biochemistry Laboratory
BMM 339	Introduction to Human Biochemistry
BIOL 105	Environmental Biology
BIOL 105L	Environmental Biology Laboratory
BIOL 115 & 115L	Principles of Biology and Principles of Biology Laboratory
BIOL 117 & 117L	Introductory Physiology and Introductory Physiology Laboratory
BIOL 219 & 219L	Cellular and Molecular Biology and Cellular & Molecular Biology Laboratory
BIOL 221	Ecology and Evolution
BIOL 235	Human Physiology
BMEG 201	Introduction to Biomedical Engineering
BMEG 311	Biomaterials
BMEG 480	Cellular Machinery
BMEG 481	Applied Bio-Molecular Modeling
BMEG 482	Introduction to Tissue Engineering
CE 310	Civil Engineering Materials
CE 332	Introduction to Transportation Engineering
CE 347 & 347L	Introduction to Environmental Engineering and Introduction to Environmental Engineering Laboratory
CE 351 & 351L	Introductory Soil Mechanics and Introductory Soil Mechanics Laboratory
CHE 414	Coal Conversion Engineering
CHE 461	Polymer Science and Engineering
CHE 462	Polymer Processing
CHE 463	Polymer Composites Processing
CHE 466	Electronic Materials Processing
CHE 471	Biochemical Engineering
CHE 472	Biochemical Separations
CHE 476	Pollution Prevention
CHE 496	Senior Thesis
CHEM 215 & 215L	Introductory Analytical Chemistry and Introductory Analytical Chemistry Laboratory
CHE 497	Research
CHEM 234 & 234L	Organic Chemistry 2 and Organic Chemistry 2 Laboratory

CHEM 310 & 310L	Instrumental Analysis and Instrumental Analysis Laboratory
CHEM 312	Environmental Chemistry
CHEM 348 & 348L	Physical Chemistry 2 and Physical Chemistry 2 Laboratory
CPE 271 & 271L	Introduction to Digital Logic Design and Digital Logic Laboratory
CS 110 & 110L	Introduction to Computer Science and Introduction to Computer Science Laboratory
CS 220	Discrete Mathematics
EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory
EE 223 & 223L	Electrical Circuits and Electrical Circuits Laboratory
ESWS 155	Elements of Environmental Protection
GEN 371 & 371L	Principles of Genetics and Principles of Genetics Laboratory
GEOL 203	Physical Oceanography
IENG 213	Engineering Statistics *Completion of IENG 213 and STAT 215 will not fulfill two elective requirements.
IENG 220 & 220L	Re-Engineering Management Systems and Re-Engineering Management Systems Laboratory
IENG 377	Engineering Economy
IENG 461	System Safety Engineering
MAE 211 & 211L	Mechatronics and Mechatronics Laboratory
MAE 215	Introduction to Aerospace Engineering
MAE 241	Statics
MAE 242	Dynamics
MAE 243	Mechanics of Materials
MAE 244L	Dynamics and Strength Laboratory
MAE 425	Internal Combustion Engines
MAE 473	Bioengineering
MSEN 350	Materials Science
MATH 303	Introduction to the Concepts of Mathematics
PHYS 211	Introduction to Mathematical Physics
PHYS 314	Introductory Modern Physics
PSIO 241	Elementary Physiology
STAT 215	Introduction to Probability and Statistics *Completion of IENG 213 and STAT 215 will not fulfill two elective requirements.
SUST 101 & 101L	Sustainable Earth and Sustainable Earth Laboratory

*

Completion of both IENG 213 and STAT 215 will not count as two separate electives as the course content is significantly similar.

SUGGESTED PLAN OF STUDY

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical B.S.Ch.E degree program that completes degree requirements in four years is as follows.

First Year

Fall	Hours	Spring	Hours
CHEM 115 & 115L (GEF 2)		4 MATH 156 (GEF 8)	4
ENGL 101 (GEF 1)		3 ENGR 102 or CHE 102	3
ENGR 101		2 PHYS 111 & 111L (GEF 8)	4

ENGR 191		1 CHEM 116 & 116L	4
MATH 155 (GEF 3)		4	
GEF 4		3	
		17	15

Second Year

Fall	Hours	Spring	Hours
CHE 221		4 CHE 230	3
CHEM 233		3 MATH 261	4
CHEM 233L		1 PHYS 112 & 112L	4
ENGL 102 (GEF 1)		3 GEF 5	3
MATH 251		4 GEF 6	3
		15	17

Third Year

Fall	Hours	Spring	Hours
CHE 321		4 CHE 323	4
CHE 322		4 CHE 325	3
Life Science Elective		4 CHE 351L	2
GEF 7		3 CHE 355	3
Technical Elective		3 Engineering Science Elective	3
		18	15

Fourth Year

Fall	Hours	Spring	Hours
CHE 315		3 CHE 435	3
CHE 452L		2 CHE 456S	3
CHE 452S		1 CHE 475	3
CHE 455 & 455S		4 Engineering Science Elective	3
Advanced Chemistry Elective		3 Technical Elective	3
Technical Elective		3	
		16	15

Total credit hours: 128

Accelerated Program

- BSChE Chemical Engineering and MSCHE Chemical Engineering (p. 7)

Accelerated Bachelor's/Master's in Chemical Engineering

Students must fulfill all degree requirements for the B.S.ChE in Chemical Engineering and all the requirements of the M.S.ChE in Chemical Engineering. Students must also meet all the requirements of the ABM.

ABM REQUIREMENTS

Code	Title	Hours
	Undergraduate Coursework	116
	Shared Bachelor's/Master's Coursework	12
	Graduate Coursework	18
Total Hours		146

SHARED COURSEWORK CURRICULUM REQUIREMENTS

Code	Title	Hours
Courses completed must be at the 400 or 500 level. At least one course must be at the 500 level.		
See BSChE and MSCHE for list of elective course options.		

Courses:

CHE 475	Chemical Process Safety	3
Engineering Science Elective		3
Engineering Science Elective (500+ level CHE course)		3
Technical Elective		3
Total Hours		12

SUGGESTED PLAN OF STUDY

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical ABM BSCHE & MSCHE degree program that completes degree requirements in five years is as follows.

First Year

Fall	Hours	Spring	Hours
CHEM 115 & 115L		4 CHEM 116 & 116L	4
ENGL 101		3 ENGR 102	3
ENGR 101		2 MATH 156	4
ENGR 191		1 PHYS 111 & 111L	4
MATH 155		4	
GEF 4		3	
		17	15

Second Year

Fall	Hours	Spring	Hours
CHE 221		4 CHE 230	3
CHEM 233 & 233L		4 MATH 261	4
ENGL 102		3 PHYS 112 & 112L	4
MATH 251		4 GEF 5	3
		GEF 6	3
		15	17

Third Year

Fall	Hours	Spring	Hours
CHE 321		4 CHE 323	4
CHE 322		4 CHE 351L	2
GEF 7		3 CHE 325	3
Life Science Technical Elective		4 CHE 355	3
Advanced Chemistry Elective		3 Technical Elective	3
		18	15

Fourth Year

Fall	Hours	Spring	Hours
CHE 315		3 CHE 435	3
CHE 452L & CHE 452S		3 CHE 456S	3
CHE 455 & 455S		4 CHE 475*	3
Technical Elective*		3 Engineering Science Elective (500+ level CHE course)*	3
Engineering Science Elective*		3 Technical Elective	3
		16	15

Fifth Year

Fall	Hours	Spring	Hours
CHE 531		3 CHE 615	3

CHE 620	3 CHE 625	3
Graduate CHE Elective (problem report or coursework) or CHE 697	3 Graduate CHE Elective (coursework only) or CHE 697	3
CHE 786	0 CHE 786	0
	9	9

Total credit hours: 146

*

Indicates courses that will be shared with the MS requirements

Major Learning Outcomes

CHEMICAL ENGINEERING

Upon graduation, all Bachelors of Science students in Chemical Engineering will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The Chemical and Biomedical Engineering Department uses an outcomes-assessment plan for continuous program improvement. Course work and design projects, in conjunction with yearly interviews provide the measures of learning outcomes. These outcomes-assessment results provide feedback to the faculty to improve teaching and learning processes.