

# Chemistry, B.S.

---

## Degree Offered

- Bachelor of Science

## Nature of the Program

Chemistry is the study of the composition, structure and properties of matter. Chemists work in the growing fields of biotechnology, environmental science, catalysis, materials science, information and computer technologies, and many others. The study of chemistry is excellent preparation for medical, pharmacy, dental, and veterinary schools. Chemistry is also an excellent field of study to prepare for many other professional careers like patent law, chemical sales, and technical writing.

## 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
<b>General Education Foundations</b>		
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.

**GPA Requirements:** A grade of C- or better in all chemistry courses below 300-level is required and courses that might serve as prerequisites for other major-required courses. This includes (but is not limited to) the following courses: PHYS 111, PHYS 112, MATH 155, and MATH 156.

## Curriculum Requirements

Code	Title	Hours
	University Requirements	19
	Program Requirements	23
	Chemistry Major Requirements	78
Total Hours		120

## 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
WVUE 191	First Year Seminar	1
Total Hours		19

## Program Requirements

Code	Title	Hours
MATH 155	Calculus 1 (GEF 3)	4
MATH 156	Calculus 2 (GEF 8)	4
MATH 251	Multivariable Calculus	4
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	4
WRIT 305	Technical Writing	3
Total Hours		23

## Chemistry Major Requirements

Code	Title	Hours
<b>An overall 2.0 GPA must be maintained in all CHEM courses.</b>		
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 2)	4
CHEM 116 & 116L	Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory (GEF 8)	4
CHEM 215 & 215L	Introductory Analytical Chemistry and Introductory Analytical Chemistry Laboratory	4
CHEM 233 & 233L	Organic Chemistry 1 and Organic Chemistry 1 Laboratory	4
CHEM 234 & 234L	Organic Chemistry 2 and Organic Chemistry 2 Laboratory	4
CHEM 310 & 310L	Instrumental Analysis and Instrumental Analysis Laboratory	4
CHEM 346	Physical Chemistry 1	3
CHEM 348 & 348L	Physical Chemistry 2 and Physical Chemistry 2 Laboratory	5
CHEM 422 & 422L	Inorganic Chemistry 2 and Inorganic Synthesis Laboratory	5
CHEM 490	Teaching Practicum: Peer-Led Team Learning	1
CHEM 494	Seminar	1
CHEM 497	Research	4
<b>Chemistry Electives (CHEM courses at the 200 level or above and/or any CHE courses)</b>		<b>9</b>
<b>Restricted Electives *</b>		<b>26</b>
<b>Assessment Examination</b>		
Total Hours		78

\*  
Restricted Electives will vary for students choosing to Minor in Biology, Computer Science or Math.

## Restricted Electives

Code	Title	Hours
BIOL 111	General Biology	0 or 4
BIOL 112	General Biology	4
BIOL 225	Biology Methods	3
BIOL 240	Microbiology	4
BIOL 303	Genetics	4
BIOL 416	Cell Biology	4
BIOL 461	Principles of Evolution	3
BIOL 466	Ecology	4

CE 204	Surveying	3
CE 312	Construction Materials	3
CE 331	Transportation Engineering	3
CE 347 & 347L	Introduction to Environmental Engineering and Introduction to Environmental Engineering Laboratory	4
CE 351 & 351L	Introductory Soil Mechanics and Introductory Soil Mechanics Laboratory	4
CE 361	Structural Analysis 1	4
CE 411	Pavement Design	3
CE 421	Hydraulic Engineering	4
CE 422	Advanced Hydraulic Engineering	3
CE 425	Engineering Hydrology	3
CE 431	Highway Engineering	3
CE 432	Traffic Engineering	3
CE 444	Advanced Sanitary Engineering	3
CE 446	Solid Waste Management	3
CE 451	Foundations Engineering	3
CE 452	Groundwater and Seepage	3
CE 453	Earthwork Design	3
CE 461	Structural Analysis 2	3
CE 462	Reinforced Concrete Design	3
CE 463	Steel Design	3
CE 464	Timber Design	3
CE 479	Integrated Civil Engineering Design-Capstone	3
CHE 100	Introduction to Chemical Engineering 1	2
CHE 201	Material and Energy Balances 1	3
CHE 202	Material and Energy Balances 2	3
CHE 312	Separation Processes	3
CHE 316	Transport Operations	4
CHE 318	Particle Processing Operations	3
CHE 320	Chemical Engineering Thermodynamics	3
CHE 327	Kinetics and Reactor Design	3
CHE 330	Modeling and Analysis	3
CHE 350	Chemical Engineering Laboratory	2
CHE 357	Design Laboratory 1	2
CHE 358	Design Laboratory 2	2
CHE 435	Chemical Process Control	3
CHE 450L	Unit Operations Laboratory 1	2
CHE 451L	Unit Operations Laboratory 2	2
CHE 457	Design Laboratory 3	3
CHE 458	Design Laboratory 4	3
CIET 320	Construction Methods and Equipment	3
CIET 325	Codes, Contracts, and Cost Analysis	3
CIET 330	Computer Applications in Hydraulics and Hydrology	3
CIET 382	Environmental Engineering Technology	3
CPE 271 & 271L	Introduction to Digital Logic Design and Digital Logic Laboratory	4
CPE 310 & 310L	Microprocessor Systems and Microprocessor Systems Laboratory	4
CPE 421	Embedded Systems	4
CPE 442	Introduction to Digital Computer Architecture	3
CS 112	Computer Science - Engineers 1	3
CS 121	Computer Science 1	4

CS 122	Computer Science 2	0 or 4
CS 201	Data Structures	3
CS 220	Discrete Mathematics	3
CS 222	Intro Software Engineering	3
CS 231	Introduction to Computer Organization	3
CS 265	C Programming	2
CS 310	Principles of Programming Languages	3
CS 320	Analysis of Algorithms	3
CS 321	Introduction to Networking	3
CS 324	Database Management	3
CS 350	Computer System Concepts	3
CS 410	Compiler Construction	3
CS 450	Operating Systems Structure	4
CS 479	Advanced Computer Science Mathematics	3
DRET 120	Drafting 1	2
DRET 314	Computer Graphics	3
EE 200	Software Tools	2
EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
EE 223 & 223L	Electrical Circuits and Electrical Circuits Laboratory	4
EE 311	Junior Instrumentation Lab	1
EE 327	Signals and Systems 1	3
EE 329	Signals and Systems 2	3
EE 335 & 335L	Electromechanical Energy Conversion and Systems and Electromechanical Energy Conversion and Systems Laboratory	4
EE 345	Engineering Electromagnetics	3
EE 355 & 355L	Analog Electronics and Analog Electronics Laboratory	4
EE 411	Fundamentals of Control Systems	3
EE 412	Automatic Control Lab	1
EE 435	Introduction to Power Electronics	3
EE 436	Power Systems Analysis	3
EE 461	Introduction to Communications Systems	3
ELET 315	Electronic Measurement and Instrumentation	4
ELET 337	Communication Systems 2	4
ELET 410	Control Systems Technology	3
ELET 420	Microprocessors and Digital Systems	0 or 4
ELET 426	Microprocessor-Based Data Acquisition and Control	0 or 4
ELET 436	Programmable Logic Controllers	4
ENGR 101	Engineering Problem Solving 1	2
ENGR 111	Software Tools for Engineers	3
ENGR 402	Fundamentals of Engineering Review	0 or 2
GNET 410	C++ Programming for Technology	3
GNET 412	Project Management	3
GNET 489	Senior Seminar and Project	2
INDT 302	Industrial Safety	3
INDT 308	Automated Manufacturing	3
INDT 354	Industrial Materials	3
INDT 384	Robotics 1	0 or 3
INDT 410	Plant Equipment and Maintenance	3
INDT 420	Construction Technology	3
ISYS 101	Introduction to Information Systems 1	3

ISYS 102	Introduction to Information Systems 2	3
ISYS 115	Discrete Structures	3
ISYS 270	Linux	3
ISYS 325	C#	3
ISYS 366	e-Commerce	3
MAE 201	Applied Engineering Analysis	3
MAE 215	Introduction to Aerospace Engineering	3
MAE 240	Manufacturing Processes	0 or 3
MAE 241	Statics	3
MAE 242	Dynamics	3
MAE 243	Mechanics of Materials	3
MAE 244L	Dynamics and Strength Laboratory	1
MAE 316	Analysis-Engineering Systems	3
MAE 320	Thermodynamics	3
MAE 321	Applied Thermodynamics	3
MAE 331	Fluid Mechanics	3
MAE 332	Experimental Methods	1
MAE 333	Mechanical Measurements	1
MAE 335	Incompressible Aerodynamics	3
MAE 336	Compressible Aerodynamics	3
MAE 340	Vibrations	3
MAE 342	Dynamics of Machines	3
MAE 343	Intermediate Mechanics of Materials	3
MAE 345	Aerospace Structures	3
MAE 365	Flight Dynamics	3
MAE 405	Senior Mechanical Engineering Lab	1
MAE 410	Materials Science	4
MAE 419	Heat Transfer Lab	1
MAE 423	Heat Transfer	3
MAE 426	Flight Vehicle Propulsion	3
MAE 434	Experimental Aerodynamics	2
MAE 454	Machine Design and Manufacturing	3
MAE 455	Computer Aided Drafting and Design	3
MAE 456	Computer-Aided Design and Finite Element Analysis	2
MAE 460	Automatic Controls	3
MAE 475S	Aircraft Design 1	3
MAE 476	Space Flight and Systems	3
MAE 480	System Design 1	3
MAE 481	Systems Design 2	3
MATH 303	Introduction to the Concepts of Mathematics	3
MATH 341	Introduction to Algebraic Structures	3
MATH 441	Applied Linear Algebra	3
MATH 448	Probability and Statistics	3
MATH 451	Introduction to Real Analysis 1	3
MATH 452	Introduction to Real Analysis 2	3
MEET 316	Dynamics	3
MEET 435	Energy Conversion Systems	3

## Suggested Plan of Study

### First Year

Fall	Hours	Spring	Hours
ENGL 101 (GEF 1)		3 ENGL 102 (GEF 1)	3
MATH 155 (GEF 3)		4 MATH 156 (GEF 8)	4
CHEM 115 & 115L (GEF 2)		4 CHEM 116 & 116L (GEF 8)	4
WVUE 191		1 Restricted Elective	4
GEF 4		3	
		15	15

### Second Year

Fall	Hours	Spring	Hours
CHEM 215 & 215L		4 CHEM 234 & 234L	4
CHEM 233 & 233L		4 PHYS 112 & 112L	4
MATH 251		4 GEF 5	3
PHYS 111 & 111L (GEF 8)		4 GEF 7	3
		16	14

### Third Year

Fall	Hours	Spring	Hours
CHEM 346		3 CHEM 310	3
WRIT 305		3 CHEM 348	3
Chemistry Elective		3 Restricted Elective	8
Restricted Elective		4	
GEF 6		3	
		16	14

### Fourth Year

Fall	Hours	Spring	Hours
CHEM 310L		1 CHEM 422L	2
CHEM 348L		2 CHEM 494	1
CHEM 422		3 CHEM 497	4
CHEM 490		1 Chemistry Elective	3
Chemistry Elective		3 Restricted Elective	5
Restricted Elective		5 Assessment Examination	0
		15	15

Total credit hours: 120

## Major Learning Outcomes

### CHEMISTRY

In addition to the general education learning outcomes listed elsewhere in the catalog, the Chemistry Department's Bachelor of Science program is designed to meet broad educational objectives and learning outcomes, which prepare students:

- To apply fundamental chemical concepts and relationships in the solution of diverse scientific problems.
- With knowledge and application of chemical analytical instrumentation, experimental design, and scientific data collection and interpretation.
- With diverse laboratory skills and techniques.
- With knowledge and application of good laboratory safety practices and environmental responsibility.
- With the ability to effectively communicate technical information through writing and speaking.
- For professional employment in the various scientific fields or to continue with advanced study, which may include graduate work in business, the sciences, health professions or law.