

# CHEMISTRY, BS

**Banner Code:** SC-BS-CHEM

## Academic Advising

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This program is approved by the American Chemical Society (<https://www.acs.org/content/acs/en.html>). Upon completion, students who choose either the BS in Chemistry with no concentration or with the Analytical Chemistry concentration are certified to the society. Students that have a keen interest in sustainability should choose the Environmental Chemistry concentration. Students planning professional careers in chemistry should choose this degree.

## Teacher Licensure

Students who wish to become teachers and plan to seek teacher licensure should consider the following options:

- Chemistry, BA or BS/Curriculum and Instruction, Accelerated MED (Secondary Education Chemistry concentration)
- Secondary Education - Chemistry (6-12) Undergraduate Certificate (<http://catalog.gmu.edu/colleges-schools/education-human-development/school-education/secondary-education-chemistry-6-12-undergraduate-certificate/>)

Interested students should attend an information session early in their undergraduate career. For more information, visit the School of Education's website (<http://gse.gmu.edu/>).

## Admissions & Policies

### Admissions

University-wide admissions policies can be found in the Undergraduate Admissions Policies (<http://catalog.gmu.edu/admissions/undergraduate-policies/>) section of this catalog.

To apply for this program, please complete the George Mason University Admissions Application (<https://www2.gmu.edu/admissions-aid/apply-now/>).

### Policies

Students must fulfill all Requirements for Bachelor's Degrees (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2>), including the Mason Core (<http://catalog.gmu.edu/mason-core/>).

CHEM 336 Physical Chemistry Lab I (Mason Core) (<http://catalog.gmu.edu/mason-core/>) or CHEM 465 Biochemistry Lab (Mason Core) (<http://catalog.gmu.edu/mason-core/>) will fulfill the writing intensive requirement for students majoring in chemistry.

### Termination from the Major

To ensure the academic integrity of the Chemistry and Biochemistry undergraduate major program, students are expected to maintain a satisfactory level of academic performance.

No chemistry, math, or science course that is required for the major may be attempted more than three times. Students who do not successfully complete such a course with a grade of C or better by the third attempt may be terminated from the major.

Students who have been terminated from the Chemistry major may not register for a chemistry course without the permission of the Department of Chemistry and Biochemistry.

A student may not declare a major in chemistry if the student has previously met the termination criteria for the major at any time, regardless of what the student's major was at the time the courses were taken.

## Requirements

### Degree Requirements

Total credits: minimum 120

Students should refer to the Admissions & Policies tab for specific policies related to this program.

Students majoring in chemistry must complete the chemistry program requirements with a minimum GPA of 2.30 and present no more than two courses with a grade of 'D' (1.00) in CHEM coursework at graduation.

### BS without Concentration

Students who do not select an optional concentration complete the curriculum requirements listed below.

#### Chemistry Courses

Code	Title	Credits
CHEM 211	General Chemistry I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 212	General Chemistry II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 213	General Chemistry Laboratory I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 214	General Chemistry Laboratory II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 313	Organic Chemistry I	3
CHEM 314	Organic Chemistry II	3
CHEM 315	Organic Chemistry Lab I	2
CHEM 318	Organic Chemistry Lab II	2
CHEM 321	Quantitative Chemical Analysis	4
CHEM 331	Physical Chemistry I	3
CHEM 332	Physical Chemistry II	3
CHEM 336	Physical Chemistry Lab I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> ) <sup>1</sup>	2
CHEM 337	Physical Chemistry Lab II	2
CHEM 422	Instrumental Methods of Chemical Analysis	3
CHEM 423	Instrumental Methods of Chemical Analysis Laboratory	2

CHEM 441	Properties and Bonding of Inorganic Compounds	3
CHEM 445	Inorganic Preparations and Techniques	2
CHEM 463	General Biochemistry I	4
Select 3 credits of chemistry electives ( <a href="http://catalog.gmu.edu/courses/chem/">http://catalog.gmu.edu/courses/chem/</a> ) <sup>2</sup>		3
<b>In Depth Electives</b>		
Select one from the following:		3
CHEM 413	Synthetic and Mechanistic Organic Chemistry	
CHEM 427	Aquatic Environmental Chemistry	
CHEM 438	Atmospheric Chemistry	
CHEM 458	Chemical Oceanography	
CHEM 464	General Biochemistry II	
CHEM 467	The Chemistry of Enzyme-Catalyzed Reactions	
CHEM 468	Bioorganic Chemistry	
Total Credits		52

1

Fulfills the writing intensive requirement.

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Any lecture, lab or research course(s)

**Mathematics Courses**

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 213	Analytic Geometry and Calculus III	3
Total Credits		11

**Physics Courses**

Code	Title	Credits
PHYS 160	University Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 161	University Physics I Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
PHYS 260	University Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 261	University Physics II Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
Total Credits		8

**Concentration in Environmental Chemistry (EVCH)**

Students who choose this concentration will have a broad knowledge of chemistry and a firm foundation in the environmental sciences covering atmospheric, aquatic, and soil. The major prepares students to work in the public or private sector as environmental chemists as well as to pursue an advanced degree.

**Chemistry Courses**

Code	Title	Credits
CHEM 211	General Chemistry I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 213	General Chemistry Laboratory I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 212	General Chemistry II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 214	General Chemistry Laboratory II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 313	Organic Chemistry I	3
CHEM 314	Organic Chemistry II	3
CHEM 315	Organic Chemistry Lab I	2
CHEM 318	Organic Chemistry Lab II	2
CHEM 321	Quantitative Chemical Analysis	4
CHEM 331	Physical Chemistry I	3
CHEM 332	Physical Chemistry II	3
CHEM 336	Physical Chemistry Lab I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> ) <sup>1</sup>	2
CHEM 337	Physical Chemistry Lab II	2
CHEM 422	Instrumental Methods of Chemical Analysis	3
CHEM 423	Instrumental Methods of Chemical Analysis Laboratory	2
CHEM 427	Aquatic Environmental Chemistry	3
CHEM 438	Atmospheric Chemistry	3
CHEM 441	Properties and Bonding of Inorganic Compounds	3
or CHEM 446	Bioorganic Chemistry	
CHEM Elective (lecture or research course) ( <a href="http://catalog.gmu.edu/courses/chem/">http://catalog.gmu.edu/courses/chem/</a> )		3
Total Credits		49

1

Fulfills the writing intensive requirement.

**Physics Courses**

Code	Title	Credits
Select one option:		8
<b>Option One:</b>		
PHYS 160	University Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 161	University Physics I Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 260	University Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 261	University Physics II Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
<b>Option Two:</b>		
PHYS 243	College Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	

PHYS 244	College Physics I Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 245	College Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 246	College Physics II Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
Total Credits		8

### Mathematics Courses

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 213	Analytic Geometry and Calculus III	3
or STAT 250	Introductory Statistics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
Total Credits		11

### Science Core Courses

Code	Title	Credits
GEOL 101 & GEOL 103	Physical Geology (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> ) and Physical Geology Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
GEOL 306	Soil Science	3
EVPP 210	Environmental Biology: Molecules and Cells	4
or BIOL 213	Cell Structure and Function (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
Total Credits		11

### Supporting Science Electives

Code	Title	Credits
Select two courses from the following: <sup>1</sup>		
CHEM 458	Chemical Oceanography	6-8
or BIOL 309	Oceanography	
or EVPP 309	Oceanography	
or GEOL 309	Oceanography	
EVPP 301	Environmental Science: Biological Diversity and Ecosystems	
EVPP 445	Principles of Environmental Toxicology	
GEOL 305	Environmental Geology (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
GEOL 313	Hydrogeology	
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory	
or EVPP 305 & EVPP 306	Environmental Microbiology Essentials and Environmental Microbiology Essentials Laboratory	
GGS 302	Global Environmental Hazards	
Total Credits		6-8

1

The discipline sequences may be interchanged only with approval by the program coordinator.

The remaining credits are fulfilled by Mason Core requirements or general electives.

### Concentration in Analytical Chemistry (ANAC)

The Analytical Chemistry concentration is designed to introduce and train students in modern aspects of analytical chemistry. Students who choose this program will be well prepared to run sophisticated analytical instruments in industry and research laboratories and to pursue an advanced degree specializing in analytical chemistry.

### Chemistry Courses

Code	Title	Credits
CHEM 211	General Chemistry I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 213	General Chemistry Laboratory I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 212	General Chemistry II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 214	General Chemistry Laboratory II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 313	Organic Chemistry I	3
CHEM 314	Organic Chemistry II	3
CHEM 315	Organic Chemistry Lab I	2
CHEM 318	Organic Chemistry Lab II	2
CHEM 321	Quantitative Chemical Analysis	4
CHEM 331	Physical Chemistry I	3
CHEM 332	Physical Chemistry II	3
CHEM 336	Physical Chemistry Lab I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> ) <sup>1</sup>	2
CHEM 337	Physical Chemistry Lab II	2
CHEM 422	Instrumental Methods of Chemical Analysis	3
CHEM 423	Instrumental Methods of Chemical Analysis Laboratory	2
CHEM 427	Aquatic Environmental Chemistry	3
or CHEM 355	Undergraduate Research	
or CHEM 451	Special Projects in Chemistry	
or CHEM 452	Special Projects in Chemistry	
CHEM 463	General Biochemistry I	4
CHEM 441	Properties and Bonding of Inorganic Compounds	3
CHEM 465	Biochemistry Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	2
or CHEM 445	Inorganic Preparations and Techniques	
CHEM 424	Principles of Chemical Separation	3
or CHEM 425	Electroanalytical Chemistry	
Total Credits		52

1

Fulfills the writing intensive requirement.

**Physics Courses**

Code	Title	Credits
PHYS 160	University Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 161	University Physics I Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
PHYS 260	University Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 261	University Physics II Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
Total Credits		8

**Mathematics Courses**

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 213	Analytic Geometry and Calculus III	3
Total Credits		11

**Supporting Science Electives**

Code	Title	Credits
Select 6 credits from the following:		6
BENG 101 or STAT 250	Introduction to Bioengineering Introductory Statistics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
ECE 101 or CHEM 620	Introduction to Electrical and Computer Engineering Modern Instrumentation	
Total Credits		6

The remaining hours are used to fulfill the Mason Core requirements and general elective courses.

CDS 130 Computing for Scientists (Mason Core) (<http://catalog.gmu.edu/mason-core/>) is required to fulfill the Mason Core IT requirement.

**Concentration in Biochemistry (BC)**

Students planning professional careers in biochemistry, the pharmaceutical industry, medicine, biotechnology, or related fields with a chemistry emphasis should choose this program instead of the Chemistry, BS without a concentration. This concentration provides students with a focus on biochemistry while retaining a strong chemistry foundation. Students are allowed to tailor the concentration to their interests with 9 credits of biology or chemistry elective credits.

**Chemistry Courses**

Code	Title	Credits
CHEM 211	General Chemistry I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 213	General Chemistry Laboratory I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 212	General Chemistry II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3

CHEM 214	General Chemistry Laboratory II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 313	Organic Chemistry I	3
CHEM 314	Organic Chemistry II	3
CHEM 315	Organic Chemistry Lab I	2
CHEM 318	Organic Chemistry Lab II	2
CHEM 321	Quantitative Chemical Analysis	4
CHEM 331	Physical Chemistry I	3
CHEM 336	Physical Chemistry Lab I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> ) <sup>1</sup>	2
CHEM 446	Bioinorganic Chemistry	3
CHEM 463	General Biochemistry I	4
CHEM 464	General Biochemistry II	3
CHEM 465	Biochemistry Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> ) <sup>1</sup>	2
Total Credits		39

<sup>1</sup>

Fulfills the writing intensive requirement.

**Mathematics Courses**

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
MATH 114	Analytic Geometry and Calculus II	4
Total Credits		8

**Physics Courses**

Code	Title	Credits
Select one option:		8
<b>Option One:</b>		
PHYS 243	College Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 244	College Physics I Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 245	College Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 246	College Physics II Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
<b>Option Two:</b>		
PHYS 160	University Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 161	University Physics I Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 260	University Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
PHYS 261	University Physics II Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
Total Credits		8

**Biology Courses**

Code	Title	Credits
BIOL 213	Cell Structure and Function (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
BIOL 305	Biology of Microorganisms	3
BIOL 306	Biology of Microorganisms Laboratory	1
Total Credits		8

**Approved Science Electives**

Code	Title	Credits
Select 9 credits of approved science electives chosen from CHEM or BIOL courses numbered 302-499 <sup>1</sup>		9
Total Credits		9

1

Other science or math courses may be approved as electives, subject to prior approval of the undergraduate coordinator.

**Concentration in Materials Chemistry (MATC)**

Students in the Materials Chemistry concentration explore nanostructures and how they relate to the macroscale physical and chemical properties of a material. Students interested in a career specializing in the synthesis and characterization of materials, as well as applied areas of materials chemistry, obtain a firm foundation in this subfield of chemistry.

**Chemistry Courses**

Code	Title	Credits
CHEM 211	General Chemistry I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 213	General Chemistry Laboratory I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 212	General Chemistry II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CHEM 214	General Chemistry Laboratory II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
CHEM 313	Organic Chemistry I	3
CHEM 314	Organic Chemistry II	3
CHEM 315	Organic Chemistry Lab I	2
CHEM 318	Organic Chemistry Lab II	2
CHEM 321	Quantitative Chemical Analysis	4
CHEM 331	Physical Chemistry I	3
CHEM 332	Physical Chemistry II	3
CHEM 336	Physical Chemistry Lab I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> ) <sup>1</sup>	2
CHEM 337	Physical Chemistry Lab II	2
CHEM 441	Properties and Bonding of Inorganic Compounds	3
CHEM 445	Inorganic Preparations and Techniques	2
CHEM 472	Modern Polymer Chemistry	3
Total Credits		40

**Mathematics Courses**

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 213	Analytic Geometry and Calculus III	3
Total Credits		11

**Physics Courses**

Code	Title	Credits
PHYS 160	University Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 161	University Physics I Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
PHYS 260	University Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 261	University Physics II Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
Total Credits		8

**Additional Science Courses**

Code	Title	Credits
Choose 12 credits from the following:		12
CHEM 355	Undergraduate Research	
CHEM 413	Synthetic and Mechanistic Organic Chemistry	
CHEM 422	Instrumental Methods of Chemical Analysis	
CHEM 423	Instrumental Methods of Chemical Analysis Laboratory	
CHEM 451	Special Projects in Chemistry	
CHEM 463	General Biochemistry I	
CHEM 465	Biochemistry Lab (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
CHEM 471	Solid State Chemistry	
CHEM 480	Fundamentals of Nanoscience and Nanomaterials	
BENG 240	Biomaterials	
ME 313	Material Science	
Total Credits		12

**Mason Core and Elective Credits**

In order to meet a minimum of 120 credits, this degree requires additional credits (specific credit counts by concentration are shown below), which may be applied toward any remaining Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements (outlined below), Requirements for Bachelor's Degrees (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2>), and electives. Students are strongly encouraged to consult with their advisors to ensure that they fulfill all requirements.

- Without concentration: 49 credits
- Environmental concentration: 33-35 credits
- Analytical concentration: 43 credits



- Biochemistry concentration: 48 credits
- Materials Chemistry concentration: 49 credits

### Mason Core

Some Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements may already be fulfilled by the major requirements listed above. Students are strongly encouraged to consult their advisors to ensure they fulfill all remaining Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements.

Students who have completed the following credentials are eligible for a waiver of the Foundation and Exploration (lower level) requirement categories. The Integration category (upper level) is not waived under this policy. See Admissions (<http://catalog.gmu.edu/admissions/undergraduate-policies/#transfertext>) for more information.

- VCCS Uniform Certificate of General Studies
- VCCS or Richard Bland Associate of Science (A.S.), Associate of Arts (A.A.), Associate of Arts and Sciences (A.A.&S.), or Associate of Fine Arts (A.F.A.)

Code	Title	Credits
<b>Foundation Requirements</b>		
	Written Communication (lower-level) ( <a href="http://catalog.gmu.edu/mason-core/#written">http://catalog.gmu.edu/mason-core/#written</a> )	3
	Oral Communication ( <a href="http://catalog.gmu.edu/mason-core/#oral">http://catalog.gmu.edu/mason-core/#oral</a> )	3
	Quantitative Reasoning ( <a href="http://catalog.gmu.edu/mason-core/#quantitative">http://catalog.gmu.edu/mason-core/#quantitative</a> )	3
	Information Technology and Computing ( <a href="http://catalog.gmu.edu/mason-core/#information-technology">http://catalog.gmu.edu/mason-core/#information-technology</a> )	3
<b>Exploration Requirements</b>		
	Arts ( <a href="http://catalog.gmu.edu/mason-core/#arts">http://catalog.gmu.edu/mason-core/#arts</a> )	3
	Global Contexts ( <a href="http://catalog.gmu.edu/mason-core/#global-contexts">http://catalog.gmu.edu/mason-core/#global-contexts</a> )	3
	Global History ( <a href="http://catalog.gmu.edu/mason-core/#global-history">http://catalog.gmu.edu/mason-core/#global-history</a> )	3
	Literature ( <a href="http://catalog.gmu.edu/mason-core/#literature">http://catalog.gmu.edu/mason-core/#literature</a> )	3
	Natural Science ( <a href="http://catalog.gmu.edu/mason-core/#natural-science">http://catalog.gmu.edu/mason-core/#natural-science</a> )	7
	Social and Behavioral Sciences ( <a href="http://catalog.gmu.edu/mason-core/#social-behavioral-science">http://catalog.gmu.edu/mason-core/#social-behavioral-science</a> )	3
	Just Societies (optional) ( <a href="http://catalog.gmu.edu/mason-core/#justsocieties">http://catalog.gmu.edu/mason-core/#justsocieties</a> ) <sup>1</sup>	
<b>Integration Requirements</b>		
	Written Communication (upper-level) ( <a href="http://catalog.gmu.edu/mason-core/#written">http://catalog.gmu.edu/mason-core/#written</a> )	3
	Writing Intensive ( <a href="http://catalog.gmu.edu/mason-core/#wi">http://catalog.gmu.edu/mason-core/#wi</a> ) <sup>2</sup>	3
	Mason Apex ( <a href="http://catalog.gmu.edu/mason-core/#apex">http://catalog.gmu.edu/mason-core/#apex</a> ) <sup>3</sup>	3
Total Credits		40

1

In addition to covering content related to the designated category, Exploration level courses marked with a *Just Societies* "flag" are specifically designed to help students learn how to interact effectively with others from all walks of life, including those with backgrounds and beliefs that differ from their own. Courses marked with the Just Societies flag are available for students starting in Fall 2024. Students admitted prior to the Fall of 2025 are not required to take courses with a Just Societies flag but may wish to do so to increase their knowledge and skills in this important area. Students interested in this approach to completing their Mason Core Exploration Requirements should work closely with their advisor to identify the appropriate Just Societies-flagged courses.

2

Most programs include the writing-intensive course designated for the major as part of the major requirements; this course is therefore not counted towards the total required for Mason Core.

3

Minimum 3 credits required.

## Honors

### Honors in the Major

Chemistry majors who have completed prerequisites for CHEM 455 Honors Research in Chemistry and CHEM 456 Honors Research in Chemistry and have maintained an overall GPA of at least 3.00 in mathematics and science courses are eligible to enter the departmental honors program. To graduate with honors in chemistry, a student is required to maintain a minimum GPA of 3.00 in mathematics and science courses and successfully complete the two semesters of CHEM 455 Honors Research in Chemistry and CHEM 456 Honors Research in Chemistry with a minimum GPA of 3.50.

In order to apply for Chemistry Honors, please complete the application (<https://cos.gmu.edu/chemistry/wp-content/uploads/sites/7/2015/08/form-honors-program-application-2016.pdf>) and submit it to the undergraduate coordinator.

## Accelerated Master's

### Chemistry, BA or BS/Curriculum and Instruction, Accelerated MEd (Secondary Education Chemistry Concentration)

#### Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's option and obtain a BA (<http://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/chemistry-ba/>) or BS in Chemistry (degree without concentration) and an MEd in Curriculum and Instruction (Secondary Education Chemistry concentration) (<https://catalog.gmu.edu/colleges-schools/education-human-development/school-education/curriculum-instruction-med/>) in an accelerated time-frame after satisfactory completion of a minimum of 143 credits.

See AP.6.7 Bachelor's/Accelerated Master's Degree (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>) for policies related to this program.

This accelerated option is offered jointly by the Department of Chemistry and Biochemistry (<http://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/>) and the School of Education (<http://catalog.gmu.edu/colleges-schools/education-human-development/school-education/>).

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/#text>).

## BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies (<https://catalog.gmu.edu/admissions/graduate-policies/>) and Bachelor's/Accelerated Master's Degree (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>) policies. For information specific to this accelerated master's program, see Application Requirements and Deadlines (<https://cehd.gmu.edu/bachelors-accelerated-masters-program/>).

Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits, and additional unit-specific criteria.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

## Accelerated Master's Admission Requirements

Students already admitted in the BAM Pathway will be admitted to the MEd program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- 3.0 overall GPA
- Completion of specific undergraduate coursework
- Successfully meeting Mason's requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

## Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following which can be taken as Advanced Standing or Reserve Graduate credit (<https://catalog.gmu.edu/policies/academic/graduate-policies/#text>) (to be determined by the student and their advisor):

Code	Title	Credits
EDRD 619	Disciplinary Literacy	3
EDUC 547	Scientific Inquiry and the Nature of Science	3
SEED 522	Foundations of Secondary Education	3
SEED 540	Human Development and Learning: Secondary Education	3
SEED 573	Teaching Science in the Secondary School	3

SEED 673	Advanced Methods of Teaching Science in the Secondary School	3
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SEED approved elective (<http://catalog.gmu.edu/courses/seed/>)

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degree (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>) policies.

## Chemistry, BS/Chemistry, Accelerated MS Overview

This bachelor's/accelerated master's degree program allows academically strong undergraduates with a commitment to advance their education to obtain both the Chemistry, BS and the Chemistry, MS (<http://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/chemistry-ms/>) degrees within an accelerated timeframe. Upon completion of this 138 credit accelerated program, students will be exceptionally well prepared for entry into their careers or into a doctoral program in the field or in a related discipline.

Students are eligible to apply for this accelerated program once they have earned at least 60 undergraduate credits. They will be able to enroll in up to 18 credits of graduate coursework after successfully completing 75 undergraduate credits. This flexibility makes it possible for students to complete a bachelor's and a master's in five years.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate degrees, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>). For more information on undergraduates enrolling in graduate courses, see AP.1.4.4 Graduate Course Enrollment by Undergraduates (<https://catalog.gmu.edu/policies/academic/registration-attendance/#text>).

## Application Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in the Graduate Admission Policies (<http://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog.

Important application information and processes for this accelerated master's program can be found here (<https://www2.gmu.edu/admissions-aid/how-apply/accelerated-masters/>).

Students should seek out the graduate program's advisor who will aid in choosing the appropriate graduate courses and help prepare the student for graduate studies.

Successful applicants will have earned 60 undergraduate credits and have an overall GPA of at least 3.00. Additionally, they will have completed 36 credits of CHEM courses with a GPA of at least 3.00.

## Accelerated Option Requirements

After the completion of 75 undergraduate credits, students may complete 3 to 12 credits of graduate coursework that can apply to both the undergraduate and graduate degrees.

In addition to applying to graduate from the undergraduate program, students in the accelerated program must submit a bachelor's/accelerated master's transition form (available from the Office of the University Registrar (<https://registrar.gmu.edu/forms/>)) to the College of

Science's Office of Academic and Student Affairs (<https://cos.gmu.edu/about/contact-us/>) by the last day to add classes of their final undergraduate semester. Students should enroll for courses in the master's program in the fall or spring semester immediately following conferral of the bachelor's degree, but should contact an advisor if they would like to defer up to one semester.

Students must maintain an overall GPA of 3.00 or higher in all graduate coursework and should consult with their faculty advisor to coordinate their academic goals.

## Reserve Graduate Credit

Accelerated master's students may also take up to 6 graduate credits as reserve graduate credits. These credits do not apply to the undergraduate degree, but will reduce the master's degree by up to 6 credits. With 12 graduate credits counted toward the undergraduate and graduate degrees plus the maximum 6 reserve graduate credits, the credits necessary for the graduate degree can be reduced by up to 18.

## Graduate Course Suggestions

The following list of suggested courses is provided for general reference. To ensure an efficient route to graduation and post-graduation readiness, students are strongly encouraged to meet with an advisor before registering for graduate-level courses.

Code	Title	Credits
CHEM 633	Chemical Thermodynamics and Kinetics <sup>1</sup>	
<b>For Students Interested in the Environmental Sciences</b>		
CHEM 627	Aquatic Environmental Chemistry	
CHEM 651	Environmental Chemistry of Organic Substances	
<b>For Students Interested in Biochemistry</b>		
CHEM 567	The Chemistry of Enzyme-Catalyzed Reactions	
CHEM 660	Protein Biochemistry	
<b>For Students Interested in Organic Chemistry</b>		
CHEM 568	Bioorganic Chemistry	
CHEM 613	Modern Polymer Chemistry	
CHEM 614	Physical Organic Chemistry	
<b>For Students Interested in Inorganic Chemistry</b>		
CHEM 641	Solid State Chemistry	
CHEM 646	Bioinorganic Chemistry	
<b>For Students Interested in Analytical Chemistry</b>		
CHEM 624	Principles of Chemical Separation	
CHEM 625	Electroanalytical Chemistry	
<b>For Students Interested in Materials Science</b>		
CHEM 680	Fundamentals of Nanoscience and Nanomaterials	

1

This course covers the advanced concepts necessary to understand the mechanism and kinetics of chemical reactions.

# Bachelor's Degree (selected), Bioinformatics Management, Accelerated PSM

## Overview

This bachelor's/accelerated master's degree program allows academically strong undergraduates with a commitment to advance their education to obtain both the Biology, BS (<https://catalog.gmu.edu/colleges-schools/science/biology/biology-bs/>), or the Chemistry, BS, or the Computational and Data Sciences, BS (<https://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-data-sciences-bs/>), or the Physics, BS (<https://catalog.gmu.edu/colleges-schools/science/physics-astronomy/physics-bs/>), or the Neuroscience, BS (<https://catalog.gmu.edu/colleges-schools/science/neuroscience-program/neuroscience-bs/>) and the Bioinformatics Management, PSM (<https://catalog.gmu.edu/colleges-schools/science/systems-biology/bioinformatics-management-professional-science-masters/>) degrees within an accelerated timeframe. Upon completion of this 138 credit accelerated program, students will be exceptionally well prepared for entry into their careers or into a doctoral program in the field or in a related discipline.

Students are eligible to apply for this accelerated program once they have earned at least 60 undergraduate credits and can enroll in up to 18 credits of graduate coursework after successfully completing 75 undergraduate credits. This flexibility makes it possible for students to complete a bachelor's and a master's in five years.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate degrees, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>). For more information on undergraduates enrolling in graduate courses, see AP.1.4.4 Graduate Course Enrollment by Undergraduates (<https://catalog.gmu.edu/policies/academic/registration-attendance/#text>).

## Application Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in the Graduate Admission Policies (<http://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog.

Important application information and processes for this accelerated master's program can be found here (<https://www2.gmu.edu/admissions-aid/how-apply/accelerated-masters/>).

Students in the Biology, BS (<https://catalog.gmu.edu/colleges-schools/science/biology/biology-bs/>); Chemistry, BS (<https://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/chemistry-bs/>); Computational and Data Sciences, BS (<https://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-data-sciences-bs/>); Neuroscience, BS (<https://catalog.gmu.edu/colleges-schools/science/neuroscience-program/neuroscience-bs/>); or Physics, BS (<https://catalog.gmu.edu/colleges-schools/science/physics-astronomy/physics-bs/>) with an overall GPA of at least 3.00 in their last 60 credits are welcome to apply to the Bioinformatics Management, PSM (<http://catalog.gmu.edu/colleges-schools/science/systems-biology/bioinformatics-management-professional-science-masters/>) accelerated master's program. Applicants to this accelerated master's should have previously taken courses in molecular biology, computer science,



calculus, physical chemistry, and statistics. Students with deficiencies in one or more of these areas may be required to take additional courses from the undergraduate curriculum.

The GRE requirement is waived for students accepted into this accelerated program.

Students should seek out the graduate program's advisor who will aid in choosing the appropriate graduate courses and help prepare the student for graduate studies.

## Accelerated Option Requirements

After the completion of 75 undergraduate credits, students may complete 3 to 12 credits of graduate coursework that can apply to both the undergraduate and graduate degrees.

In addition to applying to graduate from the undergraduate program, students in the accelerated program must submit a bachelor's/accelerated master's transition form (available from the Office of the University Registrar (<https://registrar.gmu.edu/forms/>)) to the College of Science's Office of Academic and Student Affairs (<https://cos.gmu.edu/about/contact-us/>) by the last day to add classes of their final undergraduate semester. Students should enroll for courses in the master's program in the fall or spring semester immediately following conferral of the bachelor's degree, but should contact an advisor if they would like to defer up to one semester.

Students must maintain an overall GPA of 3.00 or higher in all graduate coursework and should consult with their faculty advisor to coordinate their academic goals.

## Reserve Graduate Credits

Accelerated master's students may also take up to 6 graduate credits as reserve graduate credits. These credits do not apply to the undergraduate degree, but will reduce the master's degree by up to 6 credits. With 12 graduate credits counted toward the undergraduate and graduate degrees plus the maximum 6 reserve graduate credits, the credits necessary for the graduate degree can be reduced by up to 18.

## Graduate Course Suggestions

The following list of suggested courses is provided for general reference. To ensure an efficient route to graduation and post-graduation readiness, students are strongly encouraged to meet with an advisor before registering for graduate-level courses.

Code	Title	Credits
BINF 630	Bioinformatics Methods	3
BINF 631	Molecular Cell Biology for Bioinformatics	3
GBUS 623	Marketing Management	3
GBUS 643	Managerial Finance	3
GBUS 738	Data Mining for Business Analytics	3