CHEMISTRY, BS

Banner Code: SC-BS-CHEM

Academic Advising

Phone: 703-993-1070
Email: chemug@gmu.edu
Website: science.gmu.edu/academics/departments-units/chemistry-biochemistry/majors-minors

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 can pursue either the Chemistry, BA (https://catalog.gmu.edu/colleges-schools/science/chemistry-biochemistry/chemistry-ba/) or the Chemistry, BS in addition to obtaining teaching credentials. For more information, visit the Secondary Education program's webpage (https://education.gmu.edu/secondary-education/).

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Undergraduate Admissions Policies (https://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 (https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2), including the Mason Core (https://catalog.gmu.edu/mason-core/).

CHEM 336 Physical Chemistry Lab I (Mason Core) (https://catalog.gmu.edu/mason-core/) or CHEM 465 Biochemistry Lab (Mason Core) (https://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) (https://catalog.gmu.edu/mason-core/)	3
CHEM 212	General Chemistry II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
CHEM 213	General Chemistry Laboratory I (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
CHEM 214	General Chemistry Laboratory II (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/) [1]	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 (https://catalog.gmu.edu/courses/chem/) [2]		3
In Depth Electives		
Select one course 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.
[2] Any lecture, lab or research course(s).

Mathematics Courses

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/)	3
PHYS 161	University Physics I Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
PHYS 260	University Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 261	University Physics II Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/)	3
CHEM 213	General Chemistry Laboratory I (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
CHEM 212	General Chemistry II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
CHEM 214	General Chemistry Laboratory II (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/) [1]	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	Bioinorganic Chemistry	
CHEM Elective (lecture or research course) (https://catalog.gmu.edu/courses/chem/)		3
Total Credits		**49**

[1] Fulfills the writing intensive requirement.

Physics Courses

Code	Title	Credits
Select one option:		8
Option One:		
PHYS 160	University Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 161	University Physics I Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 260	University Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	

PHYS 261	University Physics II Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	
Option Two:		
PHYS 243	College Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 244	College Physics I Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 245	College Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 246	College Physics II Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	
Total Credits		**8**

Mathematics Courses

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/)	
Total Credits		**11**

Science Core Courses

Code	Title	Credits
GEOL 101 & GEOL 103	Physical Geology (Mason Core) (https://catalog.gmu.edu/mason-core/) and Physical Geology Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
GEOL 306	Soil Science	3
EVPP 210	Environmental Biology: Molecules and Cells	4
or BIOL 213 & BIOL 215	Cell Structure and Function and Cell Structure and Function Laboratory	
Total Credits		**11**

Supporting Science Electives

Code	Title	Credits
Select two courses from the following: [1]		6-8
CHEM 458	Chemical Oceanography	
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) (https://catalog.gmu.edu/mason-core/)	
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.

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) (https://catalog.gmu.edu/mason-core/)	3
CHEM 213	General Chemistry Laboratory I (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
CHEM 212	General Chemistry II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
CHEM 214	General Chemistry Laboratory II (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/) [1]	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) (https://catalog.gmu.edu/mason-core/) [1]	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) (https://catalog.gmu.edu/mason-core/)	3
PHYS 161	University Physics I Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
PHYS 260	University Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 261	University Physics II Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
Total Credits		**8**

Mathematics Courses

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	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	Introduction to Bioengineering	
or STAT 250	Introductory Statistics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	
ECE 101	Introduction to Electrical and Computer Engineering	
or CHEM 620	Modern Instrumentation	
Total Credits		**6**

CDS 130 Computing for Scientists (Mason Core) (https://catalog.gmu.edu/mason-core/) is required to fulfill the Mason Core Information Technology and Computing 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) (https://catalog.gmu.edu/mason-core/)	3
CHEM 213	General Chemistry Laboratory I (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
CHEM 212	General Chemistry II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
CHEM 214	General Chemistry Laboratory II (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/) [1]	2
CHEM 446	Bioinorganic Chemistry	3
CHEM 463	General Biochemistry I	4
CHEM 464	General Biochemistry II	3
CHEM 465	Biochemistry Lab (Mason Core) (https://catalog.gmu.edu/mason-core/) [1]	2
Total Credits		**39**

[1] Fulfills the writing intensive requirement.

Mathematics Courses

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
MATH 114	Analytic Geometry and Calculus II	4
Total Credits		**8**

Physics Courses

Code	Title	Credits
Select one option:		8
Option One:		
PHYS 243	College Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	

PHYS 244	College Physics I Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 245	College Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 246	College Physics II Lab (Mason Core) (https://catalog.gmu.edu/mason-core/)	
Option Two:		
PHYS 160	University Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 161	University Physics I Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 260	University Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 261	University Physics II Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	
Total Credits		**8**

Biology Courses

Code	Title	Credits
BIOL 213 & BIOL 215	Cell Structure and Function and Cell Structure and Function Laboratory	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 [1]		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) (https://catalog.gmu.edu/mason-core/)	3
CHEM 213	General Chemistry Laboratory I (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
CHEM 212	General Chemistry II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
CHEM 214	General Chemistry Laboratory II (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/) [1]	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**

[1] Fulfills the writing intensive requirement.

Mathematics Courses

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/)	3
PHYS 161	University Physics I Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	1
PHYS 260	University Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)	3
PHYS 261	University Physics II Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/)	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) (https://catalog.gmu.edu/mason-core/)	
CHEM 471	Solid State Chemistry	
CHEM 480	Fundamentals of Nanoscience and Nanomaterials	
BENG 240	Biomaterials and Biomechanics	
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 (https://catalog.gmu.edu/mason-core/) requirements (outlined below), Requirements for Bachelor's Degrees (https://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 (https://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 (https://catalog.gmu.edu/mason-core/) requirements.

All Integration-level requirements must be completed at George Mason and cannot be satisfied through transfer credit. These courses are integral to the university's educational philosophy and ensure that all graduates demonstrate proficiency in writing, critical thinking, and integrative learning consistent with the university's standards. Rare exceptions to this policy may only be granted by the Provost's Office.

Students who have completed the following credentials are eligible for a waiver of the Foundation and Exploration (lower level) requirement categories with the exception of Written Communication, which must be met by transferring in or taking an approved coruse at George Mason University. The Integration category (upper level) is not waived under this policy. See Admissions (https://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
Foundation Requirements		
Written Communication (lower-level) (https://catalog.gmu.edu/mason-core/#written)		3
Oral Communication (https://catalog.gmu.edu/mason-core/#oral)		3
Quantitative Reasoning (https://catalog.gmu.edu/mason-core/#quantitative)		3
Information Technology and Computing (https://catalog.gmu.edu/mason-core/#information-technology)		3
Exploration Requirements		
Arts (https://catalog.gmu.edu/mason-core/#arts)		3
Global Contexts (https://catalog.gmu.edu/mason-core/#global-contexts)		3
Global History (https://catalog.gmu.edu/mason-core/#global-history)		3
Literature (https://catalog.gmu.edu/mason-core/#literature)		3
Natural Science (https://catalog.gmu.edu/mason-core/#natural-science)		7
Social and Behavioral Sciences (https://catalog.gmu.edu/mason-core/#social-behavioral-science)		3
Just Societies (optional) (https://catalog.gmu.edu/mason-core/#justsocieties) [1]		
Integration Requirements		
Written Communication (upper-level) (https://catalog.gmu.edu/mason-core/#written-upper)		3
Writing Intensive (https://catalog.gmu.edu/mason-core/#wi) [2]		3
Mason Apex (https://catalog.gmu.edu/mason-core/#apex) [3]		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. Students who wish to increase their knowledge and skills in this area may choose to enroll in a Just Societies-flagged course. 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://science.gmu.edu/academics/departments-units/chemistry-biochemistry/honors-program-chemistry) and submit it to the undergraduate coordinator.

Accelerated Master's

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 (https://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 (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (https://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 (https://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 [1]	
For Students Interested in the Environmental Sciences		
CHEM 627	Aquatic Environmental Chemistry	
CHEM 651	Environmental Chemistry of Organic Substances	
For Students Interested in Biochemistry		
CHEM 567	The Chemistry of Enzyme-Catalyzed Reactions	
CHEM 660	Protein Biochemistry	

For Students Interested in Organic Chemistry	
CHEM 568	Bioorganic Chemistry
CHEM 613	Modern Polymer Chemistry
CHEM 614	Physical Organic Chemistry
For Students Interested in Inorganic Chemistry	
CHEM 641	Solid State Chemistry
CHEM 646	Bioinorganic Chemistry
For Students Interested in Analytical Chemistry	
CHEM 624	Principles of Chemical Separation
CHEM 625	Electroanalytical Chemistry
For Students Interested in Materials Science	
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 (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (https://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 (https://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 (https://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	Introduction to Machine Learning for Business Applications	3

Bachelor's Degree (selected)/Quantum Science and Engineering, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the combined bachelor's and accelerated master's degree pathway program (BAM Pathway) and obtain a Bachelor of Science degree in any College of Science major and a Master of Science in Quantum Science and Engineering in an accelerated time-frame after satisfactory completion of a minimum of 138 credits.

This accelerated option is offered jointly by undergraduate Bachelor of Science programs in the College of Science and the Quantum Science and Engineering, MS program, which is jointly offered by the College of Science (https://catalog.gmu.edu/colleges-schools/science/) and the College of Engineering and Computing (https://catalog.gmu.edu/colleges-schools/engineering-computing/).

Students in an accelerated master’s degree program must fulfill all university
requirements for the master's degree. See AP.6.7 Bachelor's/Accelerated Master's Degree (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) for policies related to this program. For policies governing all graduate degrees, see AP.6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

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 accelerated master's degree policies (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7).

Students must major in a College of Science Bachelor of Science program and will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits.

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.

Accelerated Master's Admission Requirements

Undergraduate students already admitted to the BAM Pathway will be admitted to the intended master’s program if they have met the following criteria that will be verified:

- Submission of BAM Transition Form by stated deadline.
- Sufficient minimum 3.0 cumulative GPA for conferred undergraduate degree (which does not include any earned reserve graduate credits).
- Completion of approved advanced standing courses and any reserve graduate courses; please refer to policy A.P. 6.7 (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7).
- Successful completion of required minimum of 120 credits needed for undergraduate degree conferral (after exclusion any satisfactory reserve graduate credits earned).
- Successfully meeting George Mason’s requirements for undergraduate degree conferral (graduation) and timely submitting 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:

Advanced Standing Courses

Students must complete at least 3 credits from the following list of graduate-level courses while in undergraduate status, up to a maximum of 12.

Students are encouraged to consult with both their undergraduate advisor and the Quantum Science and Engineering, MS advisor:

Code	Title	Credits
Select from the following options:		**3-12**
Up to one 500-600 level specialized course from the following:		
ASTR 601	Computer Simulation in Astronomy	
BINF 690	Numerical Methods for Bioinformatics	
CS 583	Analysis of Algorithms	
CS 630	Advanced Algorithms	
CS 635	Foundations of Parallel Computation	
CSI 690	Numerical Methods	
ECE 511	Computer Architecture	
ECE 547	Applied Cryptography	
ECE 633	Error Control Coding	
ECE 647	Post-Quantum Cryptography	
GGS 579	Remote Sensing	
MATH 625	Numerical Linear Algebra	
MATH 685	Numerical Analysis	
MATH 686	Numerical Solutions of Differential Equations	

OR 541	Operations Research: Deterministic Optimization
OR 542	Operations Research: Stochastic Models
OR 646	Stochastic Optimization
PHYS 510	Computational Physics I
PHYS 613	Computational Physics II
Remaining credits are selected from the following:	
QSE 500	Ideas in Quantum Science and Technology
QSE 501	Mathematical Foundations of QSE [1]
QSE 502	Programming Foundations of QSE [1]
QSE 505	Classical and Quantum Information Theory
QSE 511	Quantum Algorithms
QSE 520	Applications of Quantum Technology
QSE 570	Quantum Computing System Design
or ECE 570	Quantum Computing System Design

Reserve Credit Courses

Students may complete up to 6 credits while in undergraduate student status, of graduate-level coursework from the list below that will only count toward the graduate degree program.

Code	Title	Credits
Select up to 6 credits of not previously completed courses from the following:		**6**
QSE 500	Ideas in Quantum Science and Technology	
QSE 501	Mathematical Foundations of QSE [1]	
QSE 502	Programming Foundations of QSE [1]	
QSE 505	Classical and Quantum Information Theory	
QSE 511	Quantum Algorithms	
QSE 520	Applications of Quantum Technology	
QSE 570	Quantum Computing System Design	
or ECE 570	Quantum Computing System Design	

[1] As only one of these courses count for Quantum Science and Engineering, MS, credit, and these courses may not be necessary for all students, consult with an academic advisor prior to enrolling in QSE 501 Mathematical Foundations of QSE or QSE 502 Programming Foundations of QSE.

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) and AP.1.4.4 Graduate Course Enrollment by Undergraduates (https://catalog.gmu.edu/policies/academic/registration-attendance/#ap-1-4-4).