Program Change Request

Date Submitted: 10/07/20 10:54 am

Viewing: SC-BS-CHEM : Chemistry, BS

Last approved: 02/11/19 4:10 pm

Last edit: 10/07/20 10:54 am

Changes proposed by: jbazaz

Catalog Pages Using this Program <u>Chemistry, BS</u>

Are you completing this form on someone else's behalf?

Yes

Requestor:

In Workflow

- **1. CHEM Assoc Chair**
- 2. CHEM Chair
- 3. SC Curriculum Committee
- 4. SC Associate Dean
- 5. SC CAT Editor
- 6. Assoc Provost-Undergraduate
- 7. Registrar:Concentrat Code
- 8. Registrar-Programs: Duration
- 9. Registrar-Programs

Approval Path

- 10/06/20 9:03 am Megan Erb (msikowit): Rollback to Initiator
- 2. 10/07/20 10:58 amMegan Erb(msikowit):Approved for CHEMAssoc Chair
- 3. 10/07/20 11:03 am Gerald Weatherspoon (grobert1): Approved for CHEM Chair

History

1. Oct 23, 2017 by clmig-jwehrheim

- 2. Mar 1, 2018 by Rebekah Zacharias (rzachari)
- 3. Mar 28, 2018 by Rebekah Zacharias (rzachari)
- 4. Feb 11, 2019 by Tory Sarro (vsarro)

Nam	e	Extension	Email
Megan Erb		4089	msikowit
Effective Catalog:	2021-2022		
Program Level:	Undergraduat	e	
Program Type:	Bachelor's		
Degree Type:	Bachelor of Sc	ience	
Title:	Chemistry, BS		
Banner Title:	Chemistry, BS		
Registrar/OAPI Use Only – SCHEV Status	Approved		
Registrar's Office Use Only – Program Start Term	Fall 2018		
Registrar/OAPI Use Only – SCHEV Letter			
Concentration(s):			
	Associated C	oncentrations	Registrar's Office Use Only: Concentratio Code

4	Materials Chemistry	MATC	
3	Analytical Chemistry	ANAC	
2	Environmental Chemistry	EVCH	
1	Biochemistry	BC	

Registrar/IRR Use Only – Concentration CIP Code

College/School:	College of Science
Department / Academic Unit:	Chemistry & Biochemistry
Jointly Owned Program?	No
Academic Themes: Science & Math	

Justification

This new Materials Chemistry concentration will allow students to focus their studies on materials synthesis and characterization. Students will take all of the foundational chemistry courses and then specialize in materials chemistry by choosing among upper level electives in this subfield. Our Department has strengthened our research and teaching manpower in materials chemistry, with the addition of four tenure-track faculty in the past two years. This concentration builds upon these existing opportunities for undergraduate research and education.

The Occupational Outlook Handbook reflects a 2019-2029 job outlook for Chemists and Materials Scientists to be 5% which is "Faster than average". The typical entry-level education for this field is a bachelor's degree, making the creation of this concentration within the bachelor's appropriate and, considering the projected increase of 4,300 jobs by 2029, also a timely addition to the Chemistry BS's curriculum.

(https://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materialsscientists.htm#TB_inline?height=325&width=325&inlineId=qf-outlook)

Total Credits Total credits: minimum 120 Required:

Registrar's Office Use Only - Program Code:

SC-BS-CHEM

Registrar/IRR Use Only – Program CIP Code

Admission Requirements:

Admissions

University-wide admissions policies can be found in the <u>Undergraduate Admissions Policies</u> section of this catalog. To apply for this program, please complete the <u>George Mason University Admissions Application</u>.

Program-Specific Policies:

Policies

Students must fulfill all <u>Requirements for Bachelor's Degrees</u>, including the <u>Mason Core</u>. <u>CHEM 336</u> Physical Chemistry Lab I or <u>CHEM 465</u> Biochemistry Lab 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.

Degree Requirements:

Students should refer to the <u>Admissions & Policies</u> 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

<u>CHEM 211</u>	General Chemistry I <u>(Mason Core)</u>	3
<u>CHEM 212</u>	General Chemistry II <u>(Mason Core)</u>	3
<u>CHEM 213</u>	General Chemistry Laboratory I <u>(Mason Core)</u>	1
<u>CHEM 214</u>	General Chemistry Laboratory II <u>(Mason Core)</u>	1
<u>CHEM 313</u>	Organic Chemistry I	3
<u>CHEM 314</u>	Organic Chemistry II	3
<u>CHEM 315</u>	Organic Chemistry Lab I	2
<u>CHEM 318</u>	Organic Chemistry Lab II	2
<u>CHEM 321</u>	Quantitative Chemical Analysis	4
<u>CHEM 331</u>	Physical Chemistry I	3
<u>CHEM 332</u>	Physical Chemistry II	3
<u>CHEM 336</u>	Physical Chemistry Lab I 1	2
<u>CHEM 337</u>	Physical Chemistry Lab II	2
<u>CHEM 422</u>	Instrumental Methods of Chemical Analysis	3
<u>CHEM 423</u>	Instrumental Methods of Chemical Analysis Laboratory	2
<u>CHEM 441</u>	Properties and Bonding of Inorganic Compounds	3
<u>CHEM 445</u>	Inorganic Preparations and Techniques	2

10/12/2020	SC-BS-CHEM: Chemistry, BS	
<u>CHEM 463</u>	General Biochemistry I	4
Select 3 credits of	<u>chemistry electives</u> 2	3
In Depth Electives		
Select one from th	e following:	3
<u>CHEM 413</u>	Synthetic and Mechanistic Organic Chemistry	
<u>CHEM 427</u>	Aquatic Environmental Chemistry	
<u>CHEM 438</u>	Atmospheric Chemistry	
<u>CHEM 458</u>	Chemical Oceanography	
<u>CHEM 464</u>	General Biochemistry II	
<u>CHEM 467</u>	The Chemistry of Enzyme-Catalyzed Reactions	
<u>CHEM 468</u>	Bioorganic Chemistry	
Total Credits		52
1 Fulfills the writ	ting intensive requirement.	
2 Any lecture, la	b or research course(s)	
Mathematics Co	urses	
<u>MATH 113</u>	Analytic Geometry and Calculus I <u>(Mason Core)</u>	4
<u>MATH 114</u>	Analytic Geometry and Calculus II	4
<u>MATH 213</u>	Analytic Geometry and Calculus III	3
Total Credits		11
Physics Courses		
<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>	3
<u>PHYS 161</u>	University Physics I Laboratory <u>(Mason Core)</u>	1
<u>PHYS 260</u>	University Physics II <u>(Mason Core)</u>	3
<u>PHYS 261</u>	University Physics II Laboratory <u>(Mason Core)</u>	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		
<u>CHEM 211</u>	General Chemistry I <u>(Mason Core)</u>	3
<u>CHEM 213</u>	General Chemistry Laboratory I <u>(Mason Core)</u>	1
<u>CHEM 212</u>	General Chemistry II <u>(Mason Core)</u>	3
<u>CHEM 214</u>	General Chemistry Laboratory II <u>(Mason Core)</u>	1
<u>CHEM 313</u>	Organic Chemistry I	3
<u>CHEM 314</u>	Organic Chemistry II	3
<u>CHEM 315</u>	Organic Chemistry Lab I	2
<u>CHEM 318</u>	Organic Chemistry Lab II	2
<u>CHEM 321</u>	Quantitative Chemical Analysis	4
<u>CHEM 331</u>	Physical Chemistry I	3

https://workingcatalog.gmu.edu/courseleaf/approve/?role=SC Curriculum Committee

10/12/2020	SC-BS-CHEM: Chemistry, BS	
<u>CHEM 332</u>	Physical Chemistry II	3
<u>CHEM 336</u>	Physical Chemistry Lab I 1	2
<u>CHEM 337</u>	Physical Chemistry Lab II	2
<u>CHEM 422</u>	Instrumental Methods of Chemical Analysis	3
<u>CHEM 423</u>	Instrumental Methods of Chemical Analysis Laboratory	2
<u>CHEM 427</u>	Aquatic Environmental Chemistry	3
<u>CHEM 438</u>	Atmospheric Chemistry	3
<u>CHEM 441</u>	Properties and Bonding of Inorganic Compounds	3
or <u>CHEM 446</u>	Bioinorganic Chemistry	
CHEM Elective (lea	<u>cture or research course)</u>	3
Total Credits		49
1 Fulfills the writ	ting intensive requirement.	
Physics Courses		
Select one option:		8
Option One:		
<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>	
<u>PHYS 161</u>	University Physics I Laboratory <u>(Mason Core)</u>	
<u>PHYS 260</u>	University Physics II <u>(Mason Core)</u>	
<u>PHYS 261</u>	University Physics II Laboratory <u>(Mason Core)</u>	
Option Two:		
<u>PHYS 243</u>	College Physics I <u>(Mason Core)</u>	
<u>PHYS 244</u>	College Physics I Lab <u>(Mason Core)</u>	
<u>PHYS 245</u>	College Physics II <u>(Mason Core)</u>	
<u>PHYS 246</u>	College Physics II Lab <u>(Mason Core)</u>	
Total Credits		8
Mathematics Co	ourses	
<u>MATH 113</u>	Analytic Geometry and Calculus I <u>(Mason Core)</u>	4
<u>MATH 114</u>	Analytic Geometry and Calculus II	4
<u>MATH 213</u>	Analytic Geometry and Calculus III	3
or <u>STAT 250</u>	Introductory Statistics I <u>(Mason Core)</u>	
Total Credits		11
Science Core Co	urses	
<u>GEOL 101</u>	Introductory Geology I <u>(Mason Core)</u>	4
<u>GEOL 306</u>	Soil Science	3
<u>EVPP 210</u>	Environmental Biology: Molecules and Cells	4
or <u>BIOL 213</u>	Cell Structure and Function <u>(Mason Core)</u>	
Total Credits		11
Supporting Scier	nce Electives	
Select two courses	s from the following: 1	6-8
<u>CHEM 458</u>	Chemical Oceanography	
or <u>BIOL 309</u>	Introduction to Oceanography	

or <u>EVPP 309</u>	Introduction to Oceanography
or <u>GEOL 309</u>	Introduction to Oceanography
<u>EVPP 301</u>	Environmental Science: Biological Diversity and Ecosystems
<u>EVPP 445</u>	Principles of Environmental Toxicology
<u>GEOL 305</u>	Environmental Geology
<u>GEOL 313</u>	Hydrogeology
<u>BIOL 305</u>	Biology of Microorganisms
& <u>BIOL 306</u>	and Biology of Microorganisms Laboratory
or <u>EVPP 305</u>	Environmental Microbiology Essentials
& <u>EVPP 306</u>	and Environmental Microbiology Essentials Laboratory
<u>GGS 302</u>	Global Environmental Hazards
Total Credits	

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

<u>CHEM 211</u>	General Chemistry I <u>(Mason Core)</u>	3
<u>CHEM 213</u>	General Chemistry Laboratory I <u>(Mason Core)</u>	1
<u>CHEM 212</u>	General Chemistry II <u>(Mason Core)</u>	3
<u>CHEM 214</u>	General Chemistry Laboratory II <u>(Mason Core)</u>	1
<u>CHEM 313</u>	Organic Chemistry I	3
<u>CHEM 314</u>	Organic Chemistry II	3
<u>CHEM 315</u>	Organic Chemistry Lab I	2
<u>CHEM 318</u>	Organic Chemistry Lab II	2
<u>CHEM 321</u>	Quantitative Chemical Analysis	4
<u>CHEM 331</u>	Physical Chemistry I	3
<u>CHEM 332</u>	Physical Chemistry II	3
<u>CHEM 336</u>	Physical Chemistry Lab I 1	2
<u>CHEM 337</u>	Physical Chemistry Lab II	2
<u>CHEM 422</u>	Instrumental Methods of Chemical Analysis	3
<u>CHEM 423</u>	Instrumental Methods of Chemical Analysis Laboratory	2
<u>CHEM 427</u>	Aquatic Environmental Chemistry	3
or <u>CHEM 355</u>	Undergraduate Research	
or <u>CHEM 451</u>	Special Projects in Chemistry	
or <u>CHEM 452</u>	Special Projects in Chemistry	
<u>CHEM 463</u>	General Biochemistry I	4
<u>CHEM 441</u>	Properties and Bonding of Inorganic Compounds	3

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<u>CHEM 465</u>	Biochemistry Lab	2
or <u>CHEM 445</u>	Inorganic Preparations and Techniques	
<u>CHEM 424</u>	Principles of Chemical Separation	3
or <u>CHEM 425</u>	Electroanalytical Chemistry	
Total Credits		52
1 Fulfills the write	ting intensive requirement.	
Physics Courses		
<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>	3
<u>PHYS 161</u>	University Physics I Laboratory <u>(Mason Core)</u>	1
<u>PHYS 260</u>	University Physics II <u>(Mason Core)</u>	3
<u>PHYS 261</u>	University Physics II Laboratory <u>(Mason Core)</u>	1
Total Credits		8
Mathematics Co	ourses	
<u>MATH 113</u>	Analytic Geometry and Calculus I <u>(Mason Core)</u>	4
<u>MATH 114</u>	Analytic Geometry and Calculus II	4
<u>MATH 213</u>	Analytic Geometry and Calculus III	3
Total Credits		11
Supporting Scier	nce Electives	
Select 6 credits fro	om the following:	6
<u>BENG 101</u>	Introduction to Bioengineering	
or <u>STAT 250</u>	Introductory Statistics I <u>(Mason Core)</u>	
<u>ECE 101</u>	Introduction to Electrical and Computer Engineering	
or <u>CHEM 620</u>	Modern Instrumentation	
Total Credits		6
The remaining hou	urs are used to fulfill the Mason Core requirements and general elective courses.	

Concentration in Biochemistry (BC)

<u>CDS 130</u> Computing for Scientists is required to fulfill the Mason Core IT requirement.

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

-		
<u>CHEM 211</u>	General Chemistry I <u>(Mason Core)</u>	3
<u>CHEM 213</u>	General Chemistry Laboratory I <u>(Mason Core)</u>	1
<u>CHEM 212</u>	General Chemistry II <u>(Mason Core)</u>	3
<u>CHEM 214</u>	General Chemistry Laboratory II <u>(Mason Core)</u>	1
<u>CHEM 313</u>	Organic Chemistry I	3
<u>CHEM 314</u>	Organic Chemistry II	3
<u>CHEM 315</u>	Organic Chemistry Lab I	2

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Total Credits

10/12/2020	SC-BS-CHEM: Chemistry, BS	
<u>CHEM 318</u>	Organic Chemistry Lab II	2
<u>CHEM 321</u>	Quantitative Chemical Analysis	4
<u>CHEM 331</u>	Physical Chemistry I	3
<u>CHEM 336</u>	Physical Chemistry Lab I 1	2
<u>CHEM 446</u>	Bioinorganic Chemistry	3
<u>CHEM 463</u>	General Biochemistry I	4
<u>CHEM 464</u>	General Biochemistry II	3
<u>CHEM 465</u>	Biochemistry Lab 1	2
Total Credits		39
1 Fulfills the writi	ng intensive requirement.	
Mathematics Cou	ırses	
<u>MATH 113</u>	Analytic Geometry and Calculus I <u>(Mason Core)</u>	4
<u>MATH 114</u>	Analytic Geometry and Calculus II	4
Total Credits		8
Physics Courses		
Select one option:		8
Option One:		
<u>PHYS 243</u>	College Physics I <u>(Mason Core)</u>	
<u>PHYS 244</u>	College Physics I Lab <u>(Mason Core)</u>	
<u>PHYS 245</u>	College Physics II <u>(Mason Core)</u>	
<u>PHYS 246</u>	College Physics II Lab <u>(Mason Core)</u>	
Option Two:		
<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>	
<u>PHYS 161</u>	University Physics I Laboratory <u>(Mason Core)</u>	
<u>PHYS 260</u>	University Physics II <u>(Mason Core)</u>	
<u>PHYS 261</u>	University Physics II Laboratory <u>(Mason Core)</u>	
Total Credits		8
Biology Courses		
<u>BIOL 213</u>	Cell Structure and Function (Mason Core)	4
<u>BIOL 305</u>	Biology of Microorganisms	3
<u>BIOL 306</u>	Biology of Microorganisms Laboratory	1
Total Credits		8
Approved Science	e Electives	
Select 9 credits of a	pproved science electives chosen from CHEM or BIOL courses numbered 302-499 1	9

10ther 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

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characterization of materials, as well as applied areas of materials chemistry, obtain a firm foundation in this subfield of chemistry. **Chemistry Courses**

•		
<u>CHEM 211</u>	General Chemistry I <u>(Mason Core)</u>	3
<u>CHEM 213</u>	General Chemistry Laboratory I (<u>Mason Core)</u>	1
<u>CHEM 212</u>	General Chemistry II <u>(Mason Core)</u>	3
<u>CHEM 214</u>	General Chemistry Laboratory II <u>(Mason Core)</u>	1
<u>CHEM 313</u>	Organic Chemistry I	3
<u>CHEM 314</u>	Organic Chemistry II	3
<u>CHEM 315</u>	Organic Chemistry Lab I	2
<u>CHEM 318</u>	Organic Chemistry Lab II	2
<u>CHEM 321</u>	Quantitative Chemical Analysis	4
<u>CHEM 331</u>	Physical Chemistry I	3
<u>CHEM 332</u>	Physical Chemistry II	3
<u>CHEM 336</u>	Physical Chemistry Lab I 1	2
<u>CHEM 337</u>	Physical Chemistry Lab II	2
<u>CHEM 441</u>	Properties and Bonding of Inorganic Compounds	3
<u>CHEM 445</u>	Inorganic Preparations and Techniques	2
<u>CHEM 472</u>	Modern Polymer Chemistry	3
Total Credits		40

Mathematics Courses

<u>MATH 113</u>	Analytic Geometry and Calculus I <u>(Mason Core)</u>	4
<u>MATH 114</u>	Analytic Geometry and Calculus II	4
<u>MATH 213</u>	Analytic Geometry and Calculus III	3
Total Credits		11

Physics Courses

<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>	3
<u>PHYS 161</u>	University Physics I Laboratory <u>(Mason Core)</u>	1
<u>PHYS 260</u>	University Physics II <u>(Mason Core)</u>	3
<u>PHYS 261</u>	University Physics II Laboratory <u>(Mason Core)</u>	1
Total Credits		8

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Additional Science	ce Courses	
Choose 12 credits	from the following:	12
<u>CHEM 355</u>	Undergraduate Research	
<u>CHEM 413</u>	Synthetic and Mechanistic Organic Chemistry	
<u>CHEM 422</u>	Instrumental Methods of Chemical Analysis	
<u>CHEM 423</u>	Instrumental Methods of Chemical Analysis Laboratory	
<u>CHEM 451</u>	Special Projects in Chemistry	
<u>CHEM 463</u>	General Biochemistry I	
<u>CHEM 465</u>	Biochemistry Lab	
<u>CHEM 471</u>	Solid State Chemistry	

<u>CHEM 480</u>	Fundamentals of Nanoscience and Nanomaterials
<u>BENG 240</u>	Biomaterials
<u>ME 313</u>	Material Science
Total Credits	

Chemistry Courses Mathematics Courses Physics Courses Biology Courses Approved Science Electives

Retroactive Requirements Updates:

Plan of Study:

Honors Information:

Honors in the Major

Chemistry majors who have completed prerequisites for <u>CHEM 455</u> Honors Research in Chemistry and <u>CHEM 456</u> 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 <u>CHEM 455</u> Honors Research in Chemistry and <u>CHEM 456</u> Honors Research in Chemistry with a minimum GPA of 3.50.

In order to apply for Chemistry Honors, please complete the <u>application</u> and submit it to the undergraduate coordinator.

Additional Program Information

This information is required by the Office of Accreditation and Program Integrity.

Courses offered via distance (if applicable):	
What is the primary delivery format for the program?	Face-to-Face Only
Does any portion of the	his program occur off-campus?
	No
Are you working with	a vendor / other collaborators to offer your program?
	No
Related Departments	
Could this program pr Virginia or elsewhere	repare students for any type of professional licensure, in

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Yes

Please explain:

Teacher licensure in conjunction with CEHD.

Are you adding or removing a licensure component?

No

Additional SCHEV & SACSCOC Information

Are you changing the total number of credits required for this program?

Are you changing the delivery format in any way (e.g adding an online option)?

Are you adding/removing a licensure option which was approved by SCHEV?

Will any portion of this program be offered at an off-campus location?

Are you adding significant new content areas to the program?

Will this program change affect any specialized accreditation?

Green Leaf Program Designation	
Is this a Green Leaf program?	No
Does this program cover material which crosses into another department?	
	No
Additional	UGC-COS_Program Mod- bschemenvironmental_001.pdf
Attachments	UGC-COS-Program Mod-bschemanalyrical_001.pdf
	UGC-COS-Program Mod-bschemdele 001[2].pdf

UGC-COS-Program Mod-bschemed_001.pdf CHEMtermfrommajorapproval.pdf

SCHEV Proposal

Executive Summary

Reviewer

Comments

Megan Erb (msikowit) (10/06/20 9:03 am): Rollback: I can't seem to edit, but the CHEM 472 credits aren't included in the total CHEM credits needed for the degree. Can you update that? It is 3 credits and the CHEM credits should then add up to 40.

Additional Comments

Is this course required of all students in this degree program?

%wi_required.eschtml%