Program Approval Form

For approval of new programs and deletions or modifications to an existing program.

Action Requested:

- [ ] Create New (SCHEV approval required except for minors)
- [ ] Inactivate Existing
- [x] Modify Existing (check **ALL** that apply)
  - [ ] Title (SCHEV approval required except for minors)
  - [ ] **Concentration** (Choose one): [x] *Add* [ ] *Delete* [ ] *Modify*
  - [ ] Degree Requirements
  - [ ] Admission Standards/ Application Requirements
  - [ ] Other Changes: _____

Type (Check one):

- [ ] B.A. [x] B.S. [ ] Minor
- [ ] Master's
- [ ] Ph.D.
- [ ] Undergraduate Certificate*
- [ ] Graduate Certificate*
- [ ] Bachelor's/Accelerated Master's [ ] Other:

College/School:	COS	**Department:**	Chemistry & Biochemistry		
Submitted by:	S.W. Slayden	**Ext:**	3-1071	**Email:**	sslayden@gmu.edu

Effective Term: Fall 2018

Please note: For students to be admitted to a new degree, minor, certificate or concentration, the program must be fully approved, entered into Banner, and published in the University Catalog.

Justification: (attach separate document if necessary)

The concentration will focus on preparing students in the field of environmental chemistry.

	Existing	New/Modified
Program Title: (Required) Title must identify subject matter. Do not include name of college/school/dept.	Chemistry, BS	
Concentration(s):		Concentration in Environmental Chemistry
Admissions Standards / Application Requirements: (Required only if different from those listed in the University Catalog)		
Degree Requirements: Consult University Catalog for models, attach separate document if necessary using track changes for modifications		See attachment
Courses offered via distance: (if applicable)		
TOTAL CREDITS REQUIRED:	120	120

***For Certificates Only:** Indicate whether students are able to pursue on a [ ] **Full-time basis** [ ] **Part-time basis**

Approval Signatures

[redacted] 10/13/17

Department Date | College/School Date | Provost's Office Date

Required for Minors and Interdisciplinary Programs

If this program may impact another unit or is in collaboration with another unit at Mason, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Undergraduate Programs only

Undergraduate Council Member | Provost Office | Undergraduate Council Approval Date

For Graduate Programs Only

Graduate Council Member | Provost Office | Graduate Council Approval Date

For Registrar Office's Use Only: Received_____ Banner_____ Catalog_____

revised 9/2/2016

Program Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference. Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

FOR ALL PROGRAMS (required)

Program Title: Chemistry, B.S.
Concentration in Environmental Chemistry

Date of Departmental Approval: Oct. 13, 2017

FOR MODIFIED PROGRAMS (required if modifying a program)

- Summary of the Modification: The Concentration in Analytical and Environmental Chemistry will be deleted and two new concentrations proposed. Environmental Chemistry will now be one of the new concentrations. The new courses to be included for the concentration will focus on environmental chemistry and on environmental courses from other COS departments.
- Text before Modification (title, degree requirements, etc.): **See next two pages**
- Text after Modification (title, degree requirements, etc.): **See next two pages**
- Reason for the Modification: The Concentration in Analytical and Environmental Chemistry did not work well as a combination concentration and very few students chose it. When one of the elective courses was deleted, and the concentration needed to be modified, we realized that two new concentrations would be better. Having two new concentrations increases the areas of concentration offered to majors and complements our existing degrees: B.S. (no concentration) and B.S. with Concentration in Biochemistry.

The Environmental Chemistry concentration in Chemistry is designed to introduce and train students in the field of environmental chemistry. Students will take essentially the same chemistry, physics, and math courses as for the Concentration in Biochemistry. However, other required chemistry courses are specifically in the environmental chemistry field. In addition, several core science courses in environmental science from Geology, EVPP, Biology, and GGS have been added to the curriculum as either requirements or electives.

Before modification

B.S.: Concentration in Analytical and Environmental Chemistry
American Chemical Society Accredited Degree

Chemistry (CHEM) (52 credits)

General Chemistry lecture and lab	□ 211 (3)	□ 213 (1)	□ 212 (3)	□ 214 (1)
Organic Chemistry lecture and lab	□ 313 (3)	□ 315(2)	□ 314 (3)	□ 318 (2)
Quantitative Chemical Analysis	□ 321 (4)			
Physical Chemistry lecture and lab	□ 331 (3)	□ 336 (2)	□ 332 (3)	□ 337 (2)
Prop. and Bonding of Inorganic Compounds	□ 441 (3)	**-or-** Bioinorganic Chemistry		□ 446(3)
General Biochemistry	□ 463 (4)			
Instrumental Methods of Chemical Analysis and Lab	□ 422 (3)	□ 423 (2)		
Inorganic Preparations and Techniques	□ 445 (2)	**-or-** Biochemistry Lab		□ 465 (2)
Aquatic Environmental Chemistry	□ 427 (3)	**-or-** Chemical Oceanography		□ 458 (3)
Atmospheric Chemistry	□ 438 (3)			

Science Area Electives (minimum 7 credits) from **(7-8 credits)**

Introductory Geology	GEOL 101 (4)	**-and-** Introduction to Oceanography	GEOL 309 (3)
-or-			
Introduction to Environmental Science I	EVPP 110(4)	**-and-** Introduction to Environmental Science II	EVPP 111 (4)
-or-			
Fundamental Inorganic Chemistry	CHEM 341 (3) and four credits from		
Undergraduate Research	CHEM 355 (1-3)		
Special Projects in Chemistry	CHEM 451/452 (1-3, 1-3)		
Honors Research in Chemistry	CHEM 455/456 (3, 3)		

Mathematics (MATH) (11 credits)

Analytic Geometry and Calculus	□ 113 **-or-** 123-124 (4)	□ 114 (4)	□ 213 (3)

Physics (PHYS) (8 credits)

University Physics	□ 160 (3)	□ 260 (3)
University Physics Lab	□ 161 (1)	□ 261 (1)

General Education (approved courses are listed in the University Catalog) (30 credits)

Written Communication	□ ENGH 101 (3) □ ENGH 302 (3)
Oral Communication	□ COMM 100 or 101 (3)
Western Civilization/World History	□ HIST 100 or 125 (3)
Information Technology	□ ___ (3))
Literature	□ ___ (3)
Fine Arts	□ ___ (3)
Social and Behavioral Sciences	□ ___ (3)
Global Understanding	□ ___ (3)
Synthesis	□ ___ (3)

Electives

□ ___ (7-8)

TOTAL CREDITS REQUIRED: 120 Minimum (of which 45 must be upper-division ≥ 300 level); overall GPA ≥ 2.00; major requirements GPA ≥ 2.30; maximum of two courses of CHEM with a "D" grade. All CHEM prerequisite courses require a grade of C or better.

After modification

B.S. in Chemistry: Concentration in Environmental Chemistry

Chemistry (CHEM) (49 credits)

General Chemistry lecture and lab	☐ 211 (3)	☐ 213 (1)	☐ 212 (3)	☐ 214 (1)
Organic Chemistry lecture and lab	☐ 313 (3)	☐ 315(2)	☐ 314 (3)	☐ 318 (2)
Quantitative Chemical Analysis	☐ 321 (4)			
Physical Chemistry lecture and lab	☐ 331 (3)	☐ 336 (2)	☐ 332 (3)	☐ 337 (2)
Prop. and Bonding of Inorganic Compounds	☐ 441 (3) **-or-**	Bioinorganic Chemistry		☐ 446(3)
Instrumental Methods of Chemical Analysis and Lab	☐ 422 (3)	☐ 423 (2)		
Aquatic Environmental Chemistry	☐ 427 (3)			
Atmospheric Chemistry	☐ 438 (3)			
CHEM Elective (lecture or research course)	☐ ___ (3)			

Physics (PHYS) (8 credits)

University Physics lecture and lab	☐ PHYS 160 (3)	☐ PHYS 161 (1)	☐ PHYS 260 (3)	☐ PHYS 261 (1)
-or-				
College Physics lecture and lab	☐ PHYS 243 (3)	☐ PHYS 244 (1)	☐ PHYS 245 (3)	☐ PHYS 246 (1)

Mathematics (MATH) (11 credits)

Analytic Geometry and Calculus	☐ 113 (4)	☐ 114 (4)	☐ 213 **-or-** STAT 250 (3)

Science Core Courses (11 credits)

Introductory Geology	☐ GEOL 101 (4)			
Soil Geology	☐ GEOL 306 (3)			
Environmental Biology: Molecules and Cells	☐ EVPP 210 (4)	**–or-**	Cell Structure and Function	BIOL 213 (4)

Science Electives (minimum 6-8 credits)

Chemical Oceanography	☐ CHEM 458 (3)	**–or-**	Intro. to Oceanography	BIOL/EVPP/GEOL 309 (3)
Envir. Sci.: Biological Diversity and Ecosystems	☐ EVPP 301(4)			
Principles of Environmental Toxicology	☐ EVPP 445 (3)			
Environmental Geology	☐ GEOL 305 (3)			
Hydrogeology	☐ GEOL 313 (3)			
Biology of Microorganisms	☐ BIOL 305/306 (4) **-or-**	Envir. Microbiology Essentials		EVPP 305/306 (4)
Global Environmental Hazards	☐ GGS 302 (3) [*Pre-requisite is GGS 121*]			

Mason Core (30 credits) (approved courses are listed in the University Catalog)

Written Communication	☐ ENGH 101 (3) **-and-**	☐ ENGH 302 (3)	
Oral Communication	☐ COMM 100 **-or-**	COMM 101 (3)	
Western Civilization/World History	☐ HIST 100 **-or-**	HIST 125 (3)	
Information Technology	☐ ___ (3)		
Literature	☐ ___ (3)		
Fine Arts	☐ ___ (3)		
Social and Behavioral Sciences	☐ ___ (3)		
Global Understanding	☐ ___ (3)		
Synthesis	☐ ___ (3)		

Electives

☐ (3-5)

TOTAL CREDITS REQUIRED: 120 Minimum (of which 45 must be upper-division ≥ 300 level); overall GPA ≥ 2.00; major requirements GPA ≥ 2.30; maximum of two courses of CHEM with a "D" grade. All CHEM prerequisite courses require a grade of C or better.

Banner Code: SC-BS-CHEM

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.

Concentration in ~~Analytical and~~ Environmental Chemistry (~~A~~EC)

~~Students planning professional careers in an industry involving chemical measurements, careers with a chemistry emphasis in the environmental science, or those seeking graduate study in analytical or environmental chemistry should choose this program.~~ Students who chose 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)	3
CHEM 213	General Chemistry Laboratory I (Mason Core)	1
CHEM 212	General Chemistry II (Mason Core)	3
CHEM 214	General Chemistry Laboratory II (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

Code	Title	Credits
CHEM 332	Physical Chemistry II	3
CHEM 336	Physical Chemistry Lab I [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 courses)	3
Total Credits		~~52~~49

Course List

1. Fulfills the writing intensive requirement.

Physics Courses

Code	Title	Credits
Mason Core: Natural Science courses:		
PHYS 160	University Physics I (Mason Core)	3

Code	Title	Credits
PHYS 161	University Physics I Laboratory (Mason Core)	1
PHYS 260	University Physics II (Mason Core)	3
PHYS 261	University Physics II Laboratory (Mason Core)	1
	or	
PHYS 243	College Physics I	3
PHYS 245	College Physics II	3
PHYS 244	College Physics I Laboratory	1
PHYS 246	College Physics II Laboratory	1
Total Credits		**8**

Course List

Mathematics Courses

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core)	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 213	Analytic Geometry and Calculus III	3
Or STAT 250	Introductory Statistics	3

Code	Title	Credits
Total Credits		**11**

Course List

Science Core Courses

Code	Title	Credits
GEOL 101	Introductory Geology	4
GEOL 306	Soil Geology	3
EVPP 210	Environmental Biology: Molecules and Cells	4
Or BIOL 213	Cell Structure and Function	4
Total Credits		**11**

Course List

Supporting Science Electives

Code	Title	Credits
Select ~~one of the following options~~ Choose six-eight credits from the following:		~~7-8~~6-8
~~GEOL 101~~GEOL 305	~~Introductory Geology I (Mason Core)~~Environmental Geology	3
~~GEOL 309~~GEOL 313	~~Introduction to Oceanography~~Hydrogeology	3

Code	Title	Credits
~~EVPP 110~~EVPP 301	~~The Ecosphere: An Introduction to Environmental Science I (Mason Core)~~Environmental Science: Biological Diversity and Ecosystems	4
EVPP 445	Principles of Environmental Toxicology	3
~~EVPP 111~~BIOL 305	Biology of Microorganisms~~The Ecosphere: An Introduction to Environmental Science II (Mason Core)~~	3
And BIOL 306	Biology of Microorganisms Lab	1
Or EVPP 305	Environmental Microbiology Essentials	3
And EVPP 306	Environmental Microbiology Essentials Lab	1
~~CHEM 341~~GGS 302	~~Fundamental Inorganic Chemistry~~Global Environmental Hazards	
CHEM~~CHEM 355~~CHEM 458	~~Undergraduate Research~~Chemical Oceanography	3
Or ~~CHEM 451~~BIOL BIOL 309 Or EVPP 309 Or GEOL 309	~~Special Projects in Chemistry~~Introduction to Oceanography	3
~~CHEM 452~~	~~Special Projects in Chemistry~~	
Total Credits		~~7~~6-8

Course List

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

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