



# 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
- Modify Existing (check ALL that apply)
  - Title (SCHEV approval required except for minors)
  - Concentration (Choose one):  Add  Delete  Modify
  - Degree Requirements
  - Admission Standards/ Application Requirements
  - Other Changes: \_\_\_\_\_

### Type (Check one):

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

College/School:  Department:   
 Submitted by:  Ext:  Email:

Effective Term: Fall  **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 to understand and operate instruments in analytical chemistry laboratories as well as to apply to graduate chemistry programs.

**Program Title: (Required)**  
Title must identify subject matter. Do not include name of college/school/dept.

**Concentration(s):**

**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

**Courses offered via distance:**  
(if applicable)

**TOTAL CREDITS REQUIRED:**

Existing	New/Modified
Chemistry, BS	
	Concentration in Analytical Chemistry
	See attachment
120	120

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

### Approval Signatures

Department  Date: 10/13/17  
 College/School  Date: 11/20/2017  
 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 \_\_\_\_\_

**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 Analytical 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. Analytical Chemistry will now be one of the new concentrations. The new courses to be included for the concentration will focus on instrumentation and analysis.
- **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 the faculty member who taught one of the elective courses retired, and thus 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 new Analytical Chemistry concentration in Chemistry is designed to introduce and train students in modern aspects of analytical chemistry. In addition to the basic core courses in chemistry (ACS accredited BS); it covers separation chemistry or electrochemistry, computing for scientists, basic electronics with real world examples, bioengineering or statistics. The program is designed to include laboratory experience in modern instrumental analysis, inorganic preparation and techniques or biochemistry techniques, and basic electronics. The present trend in analytical chemistry is the development of lab-on-a-chip by using microsensors, microfluidics integrated with microelectronics. These require an understanding that is gained from the new courses that are added to this concentration. The bioengineering course (BENG 101) introduces microsensors and microfluidics; ECE101 introduces electronics with real world examples with a lab component; CDS130 (fulfills IT requirement) teaches computer programming including Matlab. Students who graduate under this discipline will be well-prepared to run and understand sophisticated analytical instruments in industry and research labs and also for graduate schools specializing in analytical chemistry.

## Before modification

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

#### **Chemistry (CHEM) (52 credits)**

General Chemistry lecture and lab	<input type="checkbox"/> 211 (3)	<input type="checkbox"/> 213 (1)	<input type="checkbox"/> 212 (3)	<input type="checkbox"/> 214 (1)
Organic Chemistry lecture and lab	<input type="checkbox"/> 313 (3)	<input type="checkbox"/> 315(2)	<input type="checkbox"/> 314 (3)	<input type="checkbox"/> 318 (2)
Quantitative Chemical Analysis	<input type="checkbox"/> 321 (4)			
Physical Chemistry lecture and lab	<input type="checkbox"/> 331 (3)	<input type="checkbox"/> 336 (2)	<input type="checkbox"/> 332 (3)	<input type="checkbox"/> 337 (2)
Prop. and Bonding of Inorganic Compounds	<input type="checkbox"/> 441 (3)	-or-	Bioinorganic Chemistry	<input type="checkbox"/> 446(3)
General Biochemistry	<input type="checkbox"/> 463 (4)			
Instrumental Methods of Chemical Analysis and Lab	<input type="checkbox"/> 422 (3)	<input type="checkbox"/> 423 (2)		
Inorganic Preparations and Techniques	<input type="checkbox"/> 445 (2)	-or-	Biochemistry Lab	<input type="checkbox"/> 465 (2)
Aquatic Environmental Chemistry	<input type="checkbox"/> 427 (3)	-or-	Chemical Oceanography	<input type="checkbox"/> 458 (3)
Atmospheric Chemistry	<input type="checkbox"/> 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	<input type="checkbox"/> 113 -or- 123-124 (4)	<input type="checkbox"/> 114 (4)	<input type="checkbox"/> 213 (3)
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#### **Physics (PHYS) (8 credits)**

University Physics	<input type="checkbox"/> 160 (3)	<input type="checkbox"/> 260 (3)
University Physics Lab	<input type="checkbox"/> 161 (1)	<input type="checkbox"/> 261 (1)

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

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

#### **Electives**

\_\_\_ (7-8)

TOTAL CREDITS REQUIRED: 120 Minimum (of which 45 must be upper-division  $\geq$  300 level); overall GPA  $\geq$  2.00; major requirements GPA  $\geq$  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 Analytical Chemistry** **American Chemical Society Accredited Degree**

#### **Chemistry (CHEM) (46 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)
Instrumental Methods of Chemical Analysis and Lab	□ 422 (3)	□ 423 (2)		
Prop. and Bonding of Inorganic Compounds	□ 441 (3)			
General Biochemistry I	□ 463 (4)			
Inorganic Preparations and Techniques Lab	□ 445 (2)	-or-	Biochemistry Lab	□ 465 (2)

#### **Chemistry Electives (CHEM) (6 credits)**

Principles of Chemical Separation [newly proposed; cross-level listed with 624]	□ 424 (3)	-or-	Electroanalytical Chemistry [newly proposed; cross-level listed with 625]	□ 425 (3)
Aquatic Environmental Chemistry	□ 427 (3)	-or-	Undergraduate research	□355 or 451 or 452 (3)

#### **Analytical Area Courses (6 credits)**

Introduction to Bioengineering	□ BENG 101 (3)	-or-	Introductory Statistics	□ STAT 250 (3)
Intro. to Electrical & Computer Engineering	□ ECE 101 (3)	-or-	Modern Instrumentation	□ CHEM 620 (3)

#### **Mathematics (MATH) (11 credits)**

Analytic Geometry and Calculus	□ 113 (4)	□ 114 (4)	□ 213
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#### **Physics (PHYS) (8 credits)**

University Physics lecture and lab	□ 160 (3)	□ 260 (3)	□ 161 (1)	□ 261 (1)
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#### **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- 101 (3)		
Western Civilization/World History	□ HIST 100 -or- 125 (3)		
Information Technology	□ CDS 130 (3)		
Literature	□ ____ (3)		
Fine Arts	□ ____ (3)		
Social and Behavioral Sciences	□ ____ (3)		
Global Understanding	□ ____ (3)		
Synthesis	□ ____ (3)		

#### **Electives**

□ (9)

TOTAL CREDITS REQUIRED: 120 Minimum (of which 45 must be upper-division  $\geq$  300 level); overall GPA  $\geq$  2.00; major requirements GPA  $\geq$  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 Chemistry (AC)**

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**

<b>Code</b>	<b>Title</b>	<b>Credits</b>
<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>CIEM 212</u>	General Chemistry II ( <u>Mason Core</u> )	3
<u>CIEM 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>CIEM 318</u>	Organic Chemistry Lab II	2
<u>CHEM 321</u>	Quantitative Chemical Analysis	4

<b>Code</b>	<b>Title</b>	<b>Credits</b>
<u>CHEM 331</u>	Physical Chemistry I	3
<u>CHEM 332</u>	Physical Chemistry II	3
<u>CHEM 336</u>	Physical Chemistry Lab I <sup>1</sup>	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 355 or 451 or 452	Undergraduate Research courses	
<u>CHEM 463</u>	General Biochemistry I	4
<u>CHEM 441</u>	Properties and Bonding of Inorganic Compounds	3
<u>CHEM 465</u>	Biochemistry Lab <sup>1</sup>	2
or <u>CHEM 445</u>	Inorganic Preparations and Techniques	
CHEM 424	Principles of Chemical Separation (course to be cross-level listed with CHEM 624)	
or CHEM 425	Electroanalytical Chemistry (course to be cross-level listed with CHEM 424)	
<b>Total Credits</b>		<b>52</b>

Course List

<sup>1</sup> Fulfills the writing intensive requirement.

**Physics Courses**

<b>Code</b>	<b>Title</b>	<b>Credits</b>
Mason Core: Natural Science 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
<b>Total Credits</b>		<b>8</b>

Course List

**Mathematics Courses**

<b>Code</b>	<b>Title</b>	<b>Credits</b>
<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
<b>Total Credits</b>		<b>11</b>

Course List

**Supporting Science Electives**

<b>Code</b>	<b>Title</b>	<b>Credits</b>
Select one of the following options: Select 6 credits from the following:		6
<b>Option One:</b>		
BENG 101	Introduction to Bioengineering	3
or STAT 250	Introductory Statistics	3
<b>Option Two:</b>		
<u>ECE</u> 101	Introduction to Electrical and Computer Engineering	3
or CHEM 620	Modern Instrumentation	3
<b>Total Credits</b>		<b>6</b>

Course List

The remaining hours are used to fulfill the Mason Core requirements and general elective courses. CDS 160 is required to fulfill the Mason Core IT requirement.