REAL Curriculum Program Alignment Proposal

Department or	School	: ACSAT	Enter dept/school name: Chemis	istry	Date:	03/14/2020
Degree type:	⊠BS	🗆 ВА 🗆 ВВ	BA 🗆 BSN 🗆 BM 🗆 BFA 🗆 BSW 🗆 M	∕linor □0	Certific	ate
Program:	Chem	istry-Adva	anced Biochemistry Concentratior	n		
REAL Area Program Designation Sought (check all that apply): 🛛 🛛 R 🗖 E 🗖 A 🖾 L						
Dept/School Co	ontact:	Dr. Chris	Hermann, chermann@radford.ed	du		
		CHEM 11	11, CHEM 112, CHEM 216, CHEM	301, CH	IEM 30	2, CHEM 324, CHEM
		350, CHE	EM 401, CHEM 402, CHEM 421, C	HEM 45	0 <i>,</i> CHE	M 471, CHEM 472,
		CHEM 47	74, CHEM 481, CHEM 485, BIOL 1	.32, BIOI	_ 231, I	MATH 171, MATH
			′S 111 (or PHYS 221), PHYS 112 (o			

- Any degree program that fulfills a REAL area must include at least 9 unique credit hours for each area covered. At least 3 of these 9 credit hours must be at the 300 level or above
- A single major degree program may fulfill no more than three REAL areas for any one student, unless all four REAL areas are fulfilled by accreditation or licensure requirements.
- A single minor or certificate degree program may fulfill no more than two REAL areas.
- Degree program may cover up to two REAL areas using a single prefix.
- All courses documenting the coverage of a REAL area must fulfill all learning outcomes and be designated in that area.
- All courses that document fulfillment of a REAL area within a degree program of study are NOT required to be taught by the department/school. However, departments/schools are expected to formally communicate with other departments about reliance on and inclusion of courses in their degree program plans of study. Indicate this through signature of chair or director of the partnering department or school in the areas below.
- Departments or schools that seek to fulfill REAL areas must acknowledge assessment requirements for those areas. Assessment of degree seeking students is required to be conducted yearly by the department or school offering the degree program.
- If departments or schools want to use a menu of courses to fulfill a particular area, please duplicate the sections below for each REAL area and include information for each course included in the menu of options.
- Please save this file for submission as PROGRAM NAME_ProgramType.docx (Example: Criminal Justice_BS.docx)

By signing, the department/school acknowledges the above conditions and considerations:

Christine K & Hermonn	Date:4/16/20
Dept/School Signature	

Official Program Description:

Please paste the entire official program description from the Radford University catalog in the space within this box. Find those here: <u>https://catalog.radford.edu/</u>

Please note that every department/school will have to submit a catalog change proposal for program that asks the Registrar's Office to insert language about the program coverage of the REAL areas into the official Radford University catalog upon approval.

Radford University

Chemistry, B.S.

Advanced Biochemistry Concentration Advanced Professional Chemist Concentration Biochemistry: Life Sciences and Pre-Health Concentration Forensics Concentration Professional Chemist Concentration

Core Curriculum Requirements (43-47 credits)

See Core Curriculum courses.

Required Major Core Courses (32 credits)

CHEM 111 - General Chemistry I *

CHEM 112 - General Chemistry II *

CHEM 216 - Inorganic Chemistry

CHEM 301 - Organic Chemistry I

CHEM 302 - Organic Chemistry II

CHEM 324 - Analytical Chemistry

CHEM 401 - Physical Chemistry I

CHEM 450 - Career and Professional Development

CHEM 471 - Biochemistry I

Note(s):

* <u>CHEM 111</u> and <u>CHEM 112</u> have been approved for Core Curriculum credit in Natural Sciences.

Math Requirements (8-10 credits)

Option A

MATH 171 - Calculus and Analytic Geometry I

MATH 172 - Calculus and Analytic Geometry II

Option B

MATH 168 - Calculus I with Integrated Precalculus I

MATH 169 - Calculus I with Integrated Precalculus II

MATH 172 - Calculus and Analytic Geometry II

Note(s):

*MATH 168, MATH 169, MATH 171, and MATH 172 have been approved for Core Curriculum credit in

Mathematical Sciences

Biology Requirements (4 credits)

BIOL 105 - Biology for Health Sciences

or

BIOL 132 - Biology of Cells and Microorganisms

B.S. Requirements

B.S. (Non Teaching) Requirements (8 credits)

Bachelor of Science degree without a professional licensure in secondary education requires the following:

PHYS 111 - General Physics and

PHYS 112 - General Physics

or

PHYS 221 - Physics and

PHYS 222 - Physics

Advanced Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students who plan to become professional chemists. It provides an excellent foundation for graduate study in chemistry or related fields and will prepare students for careers in industrial, academic or governmental settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (27-28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 416 - Advanced Inorganic Chemistry

CHEM 424 - Instrumental Methods of Analysis

One additional 300- or higher level course (3-4 credit hours) with CHEM prefix

CHEM 421 - Polymer Chemistry

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students

who plan to become professional chemists. It will prepare students for careers in industrial, academic or governmental settings.

Other Required Courses (14 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

Four additional credits; select from 300- or higher level of courses with a CHEM prefix, including CHEM 481

Biochemistry: Life Sciences and Pre-Health Concentration

This concentration is a rigorous four year program recommended for students planning a career in pharmacy, medicine, dentistry or veterinary medicine. The first three years are designed to optimally prepare students for the pre-entrance aptitude examination (PCAT, MCAT, DAT or GRE).

Other Required Courses (16 credits)

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

8 additional credits of 300- or higher level courses with CHEM or BIOL prefix.

Advanced Biochemistry Concentration

This concentration is a rigorous four-year program recommended for students interested in a career in biochemistry. It provides a comprehensive foundation for graduate study in biochemistry, pharmacology, or related fields and prepares students for careers in industrial, governmental, or academic settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 421 - Polymer Chemistry

CHEM 424 - Instrumental Methods of Analysis

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Forensics Concentration

This concentration is a rigorous four year program recommended for students planning a career in forensic science. It

provides a comprehensive foundation for graduate study in forensic chemistry, forensic science, or

analytical chemistry and prepares students for careers in industrial, governmental, or academic settings.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

CHEM 465 - Forensic Chemistry

CHEM 481 - Undergraduate Research

BIOL 231 - Genetics, Evolution and Development

CRJU 100 - Introduction to Criminal Justice

CRJU 320 - Criminal Investigative Theory

CRJU 341 - Introduction to Forensic Science

Total Credits Needed for Degree 120

(Includes Core Curriculum requirements, required courses and electives. Students should consult with their academic advisors in selecting elective courses to complete the 120 semester hours required for graduation.)

Graduation Requirements

To graduate with a major in chemistry, a student must attain an overall major grade point average of 2.0 or higher. Different courses are considered in the calculation of the major grade point average depending on the student's concentration. All courses required for a given concentration count towards the major grade point average. In cases where additional (beyond those required) electives listed for a given concentration are taken, all count towards the major grade point average calculation.

Teaching Licensure

Students preparing to teach chemistry in the secondary schools are required to take courses in professional education in addition to Core Curriculum courses and courses required by the chemistry major. Interested students should contact the College of Education and Human Development for more information.

SCIENTIFIC AND QUANTITATIVE REASONING

SCIENTIFIC AND QUANTI	
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \square$ Elective
Course Prefix: CHEM	Is this course offered within your dept/school? $oxtimes$ Yes $\ \Box$ No
Course Number:111	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: General Chemistry	
1	Course Rotation: 🛛 🖾 Fall 🖾 Spring 🖾 Intersession 🗆 Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🛛 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
per academic year: 432	not offered in dept/school:
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $oxtimes$ Elective
Course Prefix: CHEM	Is this course offered within your dept/school? $oxtimes$ Yes $\ \Box$ No
Course Number: 112	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: General Chemistry	
П	Course Rotation: \Box Fall \boxtimes Spring \boxtimes Intersession \Box Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
per academic year: 240	not offered in dept/school:
R Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🛛 No
Course Number: 301	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: Organic Chemistry	
1	Course Rotation: 🛛 Fall 🗆 Spring 🖾 Intersession 🗆 Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
per academic year: 140	not offered in dept/school:
· · ·	quired within the Program of Study Approved for Inclusion in the General
U U	CHEM 111, CHEM 112, CHEM 120, CHEM 122, MATH 171, MATH 172, PHYS 111,
	$\Box \Box $
PHYS 112	

R Area:

Learning Goal: To apply scientific and quantitative reasoning to questions about the natural world, mathematics, or related areas.

,		
Learning Outcome 1: Students apply scientific and quantitative information to test problems and draw conclusions.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will	
	classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring	

	01/14/2020
	the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Learning Outcome 2: Students evaluate the quality of data, methods, or inferences used to generate scientific and quantitative knowledge.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Additional information for REAL Cou	ncil consideration:

HUMANISTIC OR ARTISTIC EXPRESSION

E Area:	Is this course required or an elective for your degree program? \Box Required \Box Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: 🛛 Fall 🗋 Spring 🗋 Intersession 🗋 Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	□ At least once every three years □ Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:
E Area:	Is this course required or an elective for your degree program? \Box Required \Box Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation:
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:
E Area:	Is this course required or an elective for your degree program? \Box Required \Box Elective
Course Prefix:	Is this course offered within your dept/school? \Box Yes \Box No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation:
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	\Box At least once every three years \Box Other

Projected student enrollment per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
E Designated Course Required within the Program of Study Approved for Inclusion in the General		
Education Coursework: (please list at least one, can also be listed above but does not need to be)		

E Area:			
Learning Goal: To explore humani	Learning Goal: To explore humanistic or artistic expression through inquiry or creativity.		
Learning Outcome 1: Students demonstrate understanding of diverse ideas, languages, products, or processes of humanistic inquiry or artistic expression.	Description of learning outcome assessment plan:		
Learning Outcome 2: Students critically evaluate, synthesize, or create forms of human expression or inquiry.	Description of learning outcome assessment plan:		
Additional information for REAL Council of	consideration:		

CULTURAL OR BEHAVIORAL ANALYSIS

A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
A Designated Course Re	quired within the Program of Study Approved for Inclusion in the General
0	(please list at least one, can also be listed above but does not need to be)
Euucation Coursework:	(please list at least one, can also be listed above but does not need to be)

A Area: Learning Goal: To examine the context and interactions of culture(s) and/or behavior(s).		
Learning Outcome 1: Students describe behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:	
Learning Outcome 2: Students analyze the interactions of behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:	
Additional information for REAL Coun	cil consideration:	

APPLIED LEARNING

L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\hfill\square$ Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No	
Course Number: 302	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Organic Chemistry		
	Course Rotation: 🛛 Fall 🛛 Spring 🖾 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other	
Projected student enrollment per academic year: 120	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \square$ Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🛛 No	
Course Number: 324	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Analytical		
Chemistry	Course Rotation: 🛛 Fall 🖾 Spring 🗆 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other	
Projected student enrollment per academic year: 48	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
L Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🗆 No	
Course Number: 401	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Physical Chemistry		
1	Course Rotation: 🛛 Fall 🗆 Spring 🗀 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: $oxed{B}$ Every academic year $oxed{D}$ Every semester $oxed{D}$ Every other year	
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other	
Projected student enrollment per academic year: 24	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
· · ·		
-	quired within the Program of Study Approved for Inclusion in the General	
Education Coursework: PHYS 111, PHYS 112, MATH 171, MATH 172		

L Area:

Learning Goal: To explore professional practice through the application of knowledge, skills, and critical reflection.

Learning Outcome 1: Students apply acquired knowledge and skills to	Description of learning outcome assessment plan:
develop professional identity or professional practice.	Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.

	01/11/2020
Learning Outcome 2: Students critically reflect on their learning, abilities, experiences, or role within professional contexts.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's
	assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Additional information for REAL Cour	ncil consideration:

Are existing material resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional material resources would be needed?

Are existing space resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional space resources would be needed?

Are existing human resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional human resources would be needed?

Department Curriculum Committee Recommendation:	Signature: Christopher J. Monican	Date:4/16/20
Chair/Dean on Behalf of Dept/School:	Signature: Christine K 7 Hermann	Date:4/16/20
College Curriculum Committee Approval:	Signature:	Date:
Dean/AVP Approval:	Signature:	Date:
REAL Council Recommendation:	Signature:	Date:
Faculty Senate Curriculum Committee Recommendation:	Signature:	Date:
Faculty Senate Approval:	Signature:	Date:
Provost Approval:	Signature:	Date:

REAL Curriculum Program Alignment Proposal

Department or	School	: ACSAT	Enter dept/school name: Chemistry	Date:	03/14/2020
Degree type:	⊠BS		BA □BSN □BM □BFA □BSW □Minor	□Certific	ate
Program:	Chem	istry-Adva	anced Professional Chemist Concentra	tion	
REAL Area Program Designation Sought (check all that apply): 🛛 🛛 R 🗖 E 🗖 A 🖾 L					
Dept/School Co	ntact:	Dr. Chris	Hermann, chermann@radford.edu		
		CHEM 11	11, CHEM 112, CHEM 216, CHEM 301,	CHEM 30	2, CHEM 324, CHEM
		350, CHE	EM 401, CHEM 402, CHEM 416, CHEM	421, CHE	M 450, CHEM 471,
		CHEM 48	81, CHEM 485, CHEM elective (300 or	400 level)	, BIOL 132, MATH
BS/BA Requirer	nents	171 MA	TH 172, PHYS 111 (or PHYS 221), PHYS	112 (or E	222 PHVS 222)

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- Please save this file for submission as PROGRAM NAME_ProgramType.docx (Example: Criminal Justice_BS.docx)

By signing, the department/school acknowledges the above conditions and considerations:

Christine K & Hermonn	Date:4/16/20
Dept/School Signature	

Official Program Description:

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Radford University

Chemistry, B.S.

Advanced Biochemistry Concentration Advanced Professional Chemist Concentration Biochemistry: Life Sciences and Pre-Health Concentration Forensics Concentration Professional Chemist Concentration

Core Curriculum Requirements (43-47 credits)

See Core Curriculum courses.

Required Major Core Courses (32 credits)

CHEM 111 - General Chemistry I *

CHEM 112 - General Chemistry II *

CHEM 216 - Inorganic Chemistry

CHEM 301 - Organic Chemistry I

CHEM 302 - Organic Chemistry II

CHEM 324 - Analytical Chemistry

CHEM 401 - Physical Chemistry I

CHEM 450 - Career and Professional Development

CHEM 471 - Biochemistry I

Note(s):

* <u>CHEM 111</u> and <u>CHEM 112</u> have been approved for Core Curriculum credit in Natural Sciences.

Math Requirements (8-10 credits)

Option A

MATH 171 - Calculus and Analytic Geometry I

MATH 172 - Calculus and Analytic Geometry II

Option B

MATH 168 - Calculus I with Integrated Precalculus I

MATH 169 - Calculus I with Integrated Precalculus II

MATH 172 - Calculus and Analytic Geometry II

Note(s):

*MATH 168, MATH 169, MATH 171, and MATH 172 have been approved for Core Curriculum credit in

Mathematical Sciences

Biology Requirements (4 credits)

BIOL 105 - Biology for Health Sciences

or

BIOL 132 - Biology of Cells and Microorganisms

B.S. Requirements

B.S. (Non Teaching) Requirements (8 credits)

Bachelor of Science degree without a professional licensure in secondary education requires the following:

PHYS 111 - General Physics and

PHYS 112 - General Physics

or

PHYS 221 - Physics and

PHYS 222 - Physics

Advanced Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students who plan to become professional chemists. It provides an excellent foundation for graduate study in chemistry or related fields and will prepare students for careers in industrial, academic or governmental settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (27-28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 416 - Advanced Inorganic Chemistry

CHEM 424 - Instrumental Methods of Analysis

One additional 300- or higher level course (3-4 credit hours) with CHEM prefix

CHEM 421 - Polymer Chemistry

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students

who plan to become professional chemists. It will prepare students for careers in industrial, academic or governmental settings.

Other Required Courses (14 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

Four additional credits; select from 300- or higher level of courses with a CHEM prefix, including CHEM 481

Biochemistry: Life Sciences and Pre-Health Concentration

This concentration is a rigorous four year program recommended for students planning a career in pharmacy, medicine, dentistry or veterinary medicine. The first three years are designed to optimally prepare students for the pre-entrance aptitude examination (PCAT, MCAT, DAT or GRE).

Other Required Courses (16 credits)

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

8 additional credits of 300- or higher level courses with CHEM or BIOL prefix.

Advanced Biochemistry Concentration

This concentration is a rigorous four-year program recommended for students interested in a career in biochemistry. It provides a comprehensive foundation for graduate study in biochemistry, pharmacology, or related fields and prepares students for careers in industrial, governmental, or academic settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 421 - Polymer Chemistry

CHEM 424 - Instrumental Methods of Analysis

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Forensics Concentration

This concentration is a rigorous four year program recommended for students planning a career in forensic science. It

provides a comprehensive foundation for graduate study in forensic chemistry, forensic science, or

analytical chemistry and prepares students for careers in industrial, governmental, or academic settings.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

CHEM 465 - Forensic Chemistry

CHEM 481 - Undergraduate Research

BIOL 231 - Genetics, Evolution and Development

CRJU 100 - Introduction to Criminal Justice

CRJU 320 - Criminal Investigative Theory

CRJU 341 - Introduction to Forensic Science

Total Credits Needed for Degree 120

(Includes Core Curriculum requirements, required courses and electives. Students should consult with their academic advisors in selecting elective courses to complete the 120 semester hours required for graduation.)

Graduation Requirements

To graduate with a major in chemistry, a student must attain an overall major grade point average of 2.0 or higher. Different courses are considered in the calculation of the major grade point average depending on the student's concentration. All courses required for a given concentration count towards the major grade point average. In cases where additional (beyond those required) electives listed for a given concentration are taken, all count towards the major grade point average calculation.

Teaching Licensure

Students preparing to teach chemistry in the secondary schools are required to take courses in professional education in addition to Core Curriculum courses and courses required by the chemistry major. Interested students should contact the College of Education and Human Development for more information.

SCIENTIFIC AND QUANTITATIVE REASONING

SCIENTING AND QUANTI	
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \square$ Elective
Course Prefix: CHEM	Is this course offered within your dept/school? $oxtimes$ Yes $\ \Box$ No
Course Number:111	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: General Chemistry	
1	Course Rotation: 🛛 🖾 Fall 🖾 Spring 🖾 Intersession 🗆 Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🖾 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
per academic year: 432	not offered in dept/school:
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \square$ Elective
Course Prefix: CHEM	Is this course offered within your dept/school? $oxtimes$ Yes $\ \Box$ No
Course Number: 112	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: General Chemistry	
П	Course Rotation: \Box Fall \boxtimes Spring \boxtimes Intersession \Box Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
per academic year: 240	not offered in dept/school:
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \square$ Elective
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No
Course Number: 301	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: Organic Chemistry	
1	Course Rotation: $oxtimes$ Fall \Box Spring $oxtimes$ Intersession \Box Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other
	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
Projected student enrollment	not offered in dept/school:
per academic year: 140	
0	quired within the Program of Study Approved for Inclusion in the General
Education Coursework: (CHEM 111, CHEM 112, CHEM 120, CHEM 122, MATH 171, MATH 172, PHYS 111,
PHYS 112	
L	

R Area:

Learning Goal: To apply scientific and quantitative reasoning to questions about the natural world, mathematics, or related areas.

,	
Learning Outcome 1: Students apply scientific and quantitative information to test problems and draw conclusions.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective
	action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The
	agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring

the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.

HUMANISTIC OR ARTISTIC EXPRESSION

E Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:
E Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:
E Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	\Box At least once every three years \Box Other

Projected student enrollment
per academic year:Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
not offered in dept/school:

E Designated Course Required within the Program of Study Approved for Inclusion in the General Education Coursework: (please list at least one, can also be listed above but does not need to be)

E Area:		
Learning Goal: To explore humanistic or artistic expression through inquiry or creativity.		
Learning Outcome 1: Students demonstrate understanding of diverse ideas, languages, products, or processes of humanistic inquiry or artistic expression.	Description of learning outcome assessment plan:	
Learning Outcome 2: Students critically evaluate, synthesize, or create forms of human expression or inquiry.	Description of learning outcome assessment plan:	
Additional information for REAL Council o	consideration:	

CULTURAL OR BEHAVIORAL ANALYSIS

A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
A Designated Course Re	quired within the Program of Study Approved for Inclusion in the General
0	(please list at least one, can also be listed above but does not need to be)
Euucation Coursework:	(please list at least one, can also be listed above but does not need to be)

A Area: Learning Goal: To examine the context and interactions of culture(s) and/or behavior(s).		
Learning Outcome 1: Students describe behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:	
Learning Outcome 2: Students analyze the interactions of behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:	
Additional information for REAL Coun	cil consideration:	

APPLIED LEARNING

L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\hfill\square$ Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No	
Course Number: 302	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Organic Chemistry		
	Course Rotation: 🛛 Fall 🛛 Spring 🖾 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other	
Projected student enrollment per academic year: 120	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \square$ Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🛛 No	
Course Number: 324	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Analytical		
Chemistry	Course Rotation: 🛛 Fall 🖾 Spring 🗆 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other	
Projected student enrollment per academic year: 48	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
L Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🗆 No	
Course Number: 401	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Physical Chemistry		
1	Course Rotation: 🛛 Fall 🗆 Spring 🗀 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: $oxed{B}$ Every academic year $oxed{D}$ Every semester $oxed{D}$ Every other year	
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other	
Projected student enrollment per academic year: 24	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
· · ·		
-	quired within the Program of Study Approved for Inclusion in the General	
Education Coursework: PHYS 111, PHYS 112, MATH 171, MATH 172		

L Area:

Learning Goal: To explore professional practice through the application of knowledge, skills, and critical reflection.

Learning Outcome 1: Students apply acquired knowledge and skills to	Description of learning outcome assessment plan:
develop professional identity or professional practice.	Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.

	01/11/2020
Learning Outcome 2: Students critically reflect on their learning, abilities, experiences, or role within professional contexts.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's
	assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Additional information for REAL Cour	ncil consideration:

Are existing material resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional material resources would be needed?

Are existing space resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional space resources would be needed?

Are existing human resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional human resources would be needed?

Department Curriculum Committee Recommendation:	Signature: Christopher J. Monican	Date: 4/16/20
Chair/Dean on Behalf of Dept/School:	Signature: Christine K 7 Hermann	Date:4/16/20
College Curriculum Committee Approval:	Signature:	Date:
Dean/AVP Approval:	Signature:	Date:
REAL Council Recommendation:	Signature:	Date:
Faculty Senate Curriculum Committee Recommendation:	Signature:	Date:
Faculty Senate Approval:	Signature:	Date:
Provost Approval:	Signature:	Date:

REAL Curriculum Program Alignment Proposal

Department or School	: ACSAT Enter dept/school name: Chemistry Date: 03/14/2020	
Degree type: 🛛 🖾 BS	□BA □BBA □BSN □BM □BFA □BSW □Minor □Certificate	
Program: Chem	istry- Biochemistry: Life Sciences and Pre-Health Concentration	
REAL Area Program Designation Sought (check all that apply): 🛛 🛛 R 🗆 E 🗖 A 🖾 L		
Dept/School Contact:	Dr. Chris Hermann, <u>chermann@radford.edu</u>	
CHEM 111, CHEM 112, CHEM 216, CHEM 301, CHEM 302, CHEM 324, CHEM 401, CHEM 450, CHEM 471, CHEM 472, CHEM 474, CHEM/BIO (8 credit hrs 300/400 level), BIOL 132, BIOL 231, MATH 171, MATH 172, PHYS 111 (or PHYS 221), PHYS 112 (or PHYS 222) BS/BA Requirements: PHYS 221), PHYS 112 (or PHYS 222)		

- Any degree program that fulfills a REAL area must include at least 9 unique credit hours for each area covered. At least 3 of these 9 credit hours must be at the 300 level or above
- A single major degree program may fulfill no more than three REAL areas for any one student, unless all four REAL areas are fulfilled by accreditation or licensure requirements.
- A single minor or certificate degree program may fulfill no more than two REAL areas.
- Degree program may cover up to two REAL areas using a single prefix.
- All courses documenting the coverage of a REAL area must fulfill all learning outcomes and be designated in that area.
- All courses that document fulfillment of a REAL area within a degree program of study are NOT required to be taught by the department/school. However, departments/schools are expected to formally communicate with other departments about reliance on and inclusion of courses in their degree program plans of study. Indicate this through signature of chair or director of the partnering department or school in the areas below.
- Departments or schools that seek to fulfill REAL areas must acknowledge assessment requirements for those areas. Assessment of degree seeking students is required to be conducted yearly by the department or school offering the degree program.
- If departments or schools want to use a menu of courses to fulfill a particular area, please duplicate the sections below for each REAL area and include information for each course included in the menu of options.
- Please save this file for submission as PROGRAM NAME_ProgramType.docx (Example: Criminal Justice_BS.docx)

By signing, the department/school acknowledges the above conditions and considerations:

Christine K & Hermonn	Date:4/16/20
Dept/School Signature	

Official Program Description:

Please paste the entire official program description from the Radford University catalog in the space within this box. Find those here: <u>https://catalog.radford.edu/</u>

Please note that every department/school will have to submit a catalog change proposal for program that asks the Registrar's Office to insert language about the program coverage of the REAL areas into the official Radford University catalog upon approval.

Radford University

Chemistry, B.S.

OBJ

Advanced Biochemistry Concentration Advanced Professional Chemist Concentration Biochemistry: Life Sciences and Pre-Health Concentration Forensics Concentration Professional Chemist Concentration

Core Curriculum Requirements (43-47 credits)

See Core Curriculum courses.

Required Major Core Courses (32 credits)

CHEM 111 - General Chemistry I *

CHEM 112 - General Chemistry II *

CHEM 216 - Inorganic Chemistry

CHEM 301 - Organic Chemistry I

CHEM 302 - Organic Chemistry II

CHEM 324 - Analytical Chemistry

CHEM 401 - Physical Chemistry I

CHEM 450 - Career and Professional Development

CHEM 471 - Biochemistry I

Note(s):

* <u>CHEM 111</u> and <u>CHEM 112</u> have been approved for Core Curriculum credit in Natural Sciences.

Math Requirements (8-10 credits)

Option A

MATH 171 - Calculus and Analytic Geometry I

MATH 172 - Calculus and Analytic Geometry II

Option B

MATH 168 - Calculus I with Integrated Precalculus I

MATH 169 - Calculus I with Integrated Precalculus II

MATH 172 - Calculus and Analytic Geometry II

Note(s):

*MATH 168, MATH 169, MATH 171, and MATH 172 have been approved for Core Curriculum credit in

Mathematical Sciences

Biology Requirements (4 credits)

BIOL 105 - Biology for Health Sciences

or

BIOL 132 - Biology of Cells and Microorganisms

B.S. Requirements

B.S. (Non Teaching) Requirements (8 credits)

Bachelor of Science degree without a professional licensure in secondary education requires the following:

PHYS 111 - General Physics and

PHYS 112 - General Physics

or

PHYS 221 - Physics and

PHYS 222 - Physics

Advanced Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students who plan to become professional chemists. It provides an excellent foundation for graduate study in chemistry or related fields and will prepare students for careers in industrial, academic or governmental settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (27-28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 416 - Advanced Inorganic Chemistry

CHEM 424 - Instrumental Methods of Analysis

One additional 300- or higher level course (3-4 credit hours) with CHEM prefix

CHEM 421 - Polymer Chemistry

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students

who plan to become professional chemists. It will prepare students for careers in industrial, academic or governmental settings.

Other Required Courses (14 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

Four additional credits; select from 300- or higher level of courses with a CHEM prefix, including CHEM 481

Biochemistry: Life Sciences and Pre-Health Concentration

This concentration is a rigorous four year program recommended for students planning a career in pharmacy, medicine, dentistry or veterinary medicine. The first three years are designed to optimally prepare students for the pre-entrance aptitude examination (PCAT, MCAT, DAT or GRE).

Other Required Courses (16 credits)

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

8 additional credits of 300- or higher level courses with CHEM or BIOL prefix.

Advanced Biochemistry Concentration

This concentration is a rigorous four-year program recommended for students interested in a career in biochemistry. It provides a comprehensive foundation for graduate study in biochemistry, pharmacology, or related fields and prepares students for careers in industrial, governmental, or academic settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 421 - Polymer Chemistry

CHEM 424 - Instrumental Methods of Analysis

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Forensics Concentration

This concentration is a rigorous four year program recommended for students planning a career in forensic science. It

provides a comprehensive foundation for graduate study in forensic chemistry, forensic science, or

analytical chemistry and prepares students for careers in industrial, governmental, or academic settings.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

CHEM 465 - Forensic Chemistry

CHEM 481 - Undergraduate Research

BIOL 231 - Genetics, Evolution and Development

CRJU 100 - Introduction to Criminal Justice

CRJU 320 - Criminal Investigative Theory

CRJU 341 - Introduction to Forensic Science

Total Credits Needed for Degree 120

(Includes Core Curriculum requirements, required courses and electives. Students should consult with their academic advisors in selecting elective courses to complete the 120 semester hours required for graduation.)

Graduation Requirements

To graduate with a major in chemistry, a student must attain an overall major grade point average of 2.0 or higher. Different courses are considered in the calculation of the major grade point average depending on the student's concentration. All courses required for a given concentration count towards the major grade point average. In cases where additional (beyond those required) electives listed for a given concentration are taken, all count towards the major grade point average calculation.

Teaching Licensure

Students preparing to teach chemistry in the secondary schools are required to take courses in professional education in addition to Core Curriculum courses and courses required by the chemistry major. Interested students should contact the College of Education and Human Development for more information.

SCIENTIFIC AND QUANTITATIVE REASONING

SCIENTIFIC AND QUANTI	
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\hfill\square$ Elective
Course Prefix: CHEM	Is this course offered within your dept/school? $oxtimes$ Yes $\ \Box$ No
Course Number:111	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: General Chemistry	
1	Course Rotation: \square Fall \square Spring \square Intersession \square Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🖾 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
<mark>per academic year:</mark> 432	not offered in dept/school:
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\hfill\square$ Elective
Course Prefix: CHEM	Is this course offered within your dept/school? $oxtimes$ Yes $\ \Box$ No
Course Number: 112	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: General Chemistry	
П	Course Rotation: \Box Fall \boxtimes Spring \boxtimes Intersession \Box Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other
Projected student enrollment per academic year: 240	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
R Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective
Course Prefix: CHEM	Is this course offered within your dept/school? \square Yes \square No
Course Number: 301	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title: Organic Chemistry	······································
I	Course Rotation: 🛛 Fall 🗆 Spring 🖾 Intersession 🗆 Other (Explain below)
Credit Hours: 4	
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
Revised course: \Box Yes \boxtimes No	□ At least once every three years □ Other
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
per academic year: 140	not offered in dept/school:
R Designated Course Red	guired within the Program of Study Approved for Inclusion in the General
0	CHEM 111, CHEM 112, CHEM 120, CHEM 122, MATH 171, MATH 172, PHYS 111,
	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
PHYS 112	

R Area:

Learning Goal: To apply scientific and quantitative reasoning to questions about the natural world, mathematics, or related areas.

,	
	Description of learning outcome assessment plan:
scientific and quantitative information to test problems and draw conclusions.	Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The
	department's assessment committee will then continue monitoring

	01/11/2020
	the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Learning Outcome 2: Students evaluate the quality of data, methods, or inferences used to generate scientific and quantitative knowledge.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Additional information for REAL Cour	icil consideration:

HUMANISTIC OR ARTISTIC EXPRESSION

E Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
E Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? \Box Yes \Box No
Course Prenx: Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Number. Course Title:	······,······,····,····,·····
Credit Hours:	Course Rotation: 🛛 Fall 🗆 Spring 🗆 Intersession 🗆 Other (Explain below)
New course: \Box Yes \Box No	
Revised course: \Box Yes \Box No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	□ At least once every three years □ Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:
E Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	\Box At least once every three years \Box Other
	1

Projected student enrollment
per academic year:Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
not offered in dept/school:

E Designated Course Required within the Program of Study Approved for Inclusion in the General Education Coursework: (please list at least one, can also be listed above but does not need to be)

E Area:		
Learning Goal: To explore humanistic or artistic expression through inquiry or creativity.		
Learning Outcome 1: Students demonstrate understanding of diverse ideas, languages, products, or processes of humanistic inquiry or artistic expression.	Description of learning outcome assessment plan:	
Learning Outcome 2: Students critically evaluate, synthesize, or create forms of human expression or inquiry.	Description of learning outcome assessment plan:	
Additional information for REAL Council o	consideration:	

CULTURAL OR BEHAVIORAL ANALYSIS

A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	At least once every three years Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:
A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: 🛛 Fall 🖾 Spring 🖾 Intersession 🗆 Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:
A Area:	Is this course required or an elective for your degree program? Required Elective
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.
Course Title:	
Credit Hours:	Course Rotation: 🛛 Fall 🗋 Spring 🗋 Intersession 🗋 Other (Explain below)
New course: 🗆 Yes 🛛 No	
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
	□ At least once every three years □ Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:
A Designated Course Re	quired within the Program of Study Approved for Inclusion in the General
9	(please list at least one, can also be listed above but does not need to be)
Luucation Coursework.	(picase list at least one, call also be listed above but does not need to be)

A Area: Learning Goal: To examine the context and interactions of culture(s) and/or behavior(s).	
Learning Outcome 1: Students describe behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:
Learning Outcome 2: Students analyze the interactions of behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:
Additional information for REAL Coun	cil consideration:

APPLIED LEARNING

L Area: Is this course required or an elective for your degree program? ⊠ Required □ Elective Course Number: 302 Is this course ordered within your dept/school? ⊠ Yes □ No Course Number: 302 Course Number: 302 Course Number: 302 Course Number: 302 Course Number: 302 Intended Frequency: □ Fall ⊠ Spring ⊇ Intersession □ Other (Explain below) Credit Hours: 4 Intended Frequency: □ Every academic year □ Every semester □ Every other year Projected student enrollment per academic year: 120 Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school: Course Number: 324 Is this course offered within your dept/school? ⊠ Yes □ No Course Number: 324 Intended Frequency: □ Every academic year: □ Every semester □ Every other year Course Number: 324 Course Rotation: □ Fall ⊠ Spring □ Intersession □ Other (Explain below) Credit Hours: 4 Intended Frequency: □ Every academic year □ Every semester □ Every other year Revised course: □ Yes ⊠ No Intended Frequency: □ Every academic year □ Every semester □ Every other year Revised course: □ Yes ⊠ No Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school: L Area: Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered		
Course Number: 302 If no, collaborating dept/school must also complete the remaining elements, and must sign below. Course Title: Organic Chemistry Course Rotation: Fall Spring Intersession Other (Explain below) Credit Hours: 4 New course: Yes No Intended Frequency: Every academic year Every other year Projected student enrollment per academic year: Intended Frequency: Every academic year of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school: L Area: Is this course required or an elective for your degree program? Required Elective Course Number: 324 If no, collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school: No Course Number: 34 Is this course offered within your dept/school? Yes No Course Rotation: If no, collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school Course Rotation: Fall Spring Intersession Other (Explain below) Credit Hours: 4 Is this course offered within your dept/school? Yes No Revised course: Yes No Signature of collaborating chair/director indicating acknowle	L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \square$ Elective
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Revised course: \Box Yes \boxtimes No \Box At least once every three years \Box OtherProjected student enrollment per academic year: 48Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:L Area: Course Prefix: CHEM Course Number: 401 Course Title: Physical Chemistry I Credit Hours: 4 New course: \Box Yes \boxtimes No Revised course: \Box Yes \boxtimes No 	Credit Hours: 4	
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Course Title: Physical Chemistry I Credit Hours: 4 New course: □ Yes ⊠ No Revised course: □ Yes ⊠ No Projected student enrollment per academic year: 24 L Designated Course Required within the Program of Study Approved for Inclusion in the General	Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No
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Credit Hours: 4 New course: □ Yes ⊠ No Revised course: □ Yes ⊠ No Projected student enrollment per academic year: 24 Intended Frequency: Every academic year □ Every semester □ Every other year At least once every three years □ Other Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school: L Designated Course Required within the Program of Study Approved for Inclusion in the General	Course Title: Physical Chemistry	
New course:YesYesNoRevised course:YesNoIntended Frequency:Every academic yearEvery semesterEvery other yearProjected student enrollment per academic year:Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:L Designated Course Re-uired within the Program of Study Approved for Inclusion in the General	1	Course Rotation: 🛛 Fall 🗆 Spring 🗆 Intersession 🗆 Other (Explain below)
Revised course: □ Yes ⊠ No □ At least once every three years □ Other Projected student enrollment per academic year: 24 Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school: L Designated Course Revired within the Program of Study Approved for Inclusion in the General	Credit Hours: 4	
Projected student enrollment per academic year: 24Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:L Designated Course Required within the Program of Study Approved for Inclusion in the General	New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year
per academic year: 24 not offered in dept/school: L Designated Course Required within the Program of Study Approved for Inclusion in the General	Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other
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	L Designated Course Rec	juired within the Program of Study Approved for Inclusion in the General
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L Area:

Learning Goal: To explore professional practice through the application of knowledge, skills, and critical reflection.

Learning Outcome 1: Students apply	Description of learning outcome assessment plan:
acquired knowledge and skills to develop professional identity or professional practice.	Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year.
	Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will
	develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The
	department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
	,

	01/14/2020
Learning Outcome 2: Students critically reflect on their learning, abilities, experiences, or role within professional contexts.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching
	classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the
Additional information for REAL Cour	corrective action and determine further actions if necessary.

Are existing material resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional material resources would be needed?

Are existing space resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional space resources would be needed?

Are existing human resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional human resources would be needed?

Department Curriculum Committee Recommendation:	Signature: Christopher J. Monican	Date: 4/16/20
Chair/Dean on Behalf of Dept/School:	Signature: Christine K 7 Hermann	Date:4/16/20
College Curriculum Committee Approval:	Signature:	Date:
Dean/AVP Approval:	Signature:	Date:
REAL Council Recommendation:	Signature:	Date:
Faculty Senate Curriculum Committee Recommendation:	Signature:	Date:
Faculty Senate Approval:	Signature:	Date:
Provost Approval:	Signature:	Date:

REAL Curriculum Program Alignment Proposal

Department or S	chool: A	ACSAT	Enter dept/school name: Chem	nistry	Date:	03/14/2020
Degree type:	⊠BS □B	ВА 🗆 ВВ	A 🗆 BSN 🗆 BM 🗆 BFA 🗆 BSW 🗆 N	Minor 🗆	lCertific	ate
Program:	Chemistr	ry-Forei	nsics			
REAL Area Prog	ram Desi	ignatior	n Sought (check all that apply):	\triangleright	3 R 🗆	IE 🗆 A 🖾 L
Dept/School Cor	ntact: Dr	r. Chris	Hermann, <u>chermann@radford.e</u>	<u>edu</u>		
	CH	HEM 11	11, CHEM 112, CHEM 216, CHEM	1 301, C	HEM 30	2, CHEM 350, CHEM
	32	24 <i>,</i> CHE	M 401, CHEM 402, CHEM 424, 0	CHEM 4	50 <i>,</i> CHE	M 465, CHEM 471,
	CH	HEM 48	31, BIOL 132, BIOL 231, MATH 17	71, MAT	H 172, I	PHYS 111 (or PHYS
BS/BA Requirem	ents: <u>22</u>	21) <i>,</i> PH\	YS 112 (or PHYS 222), CRJU 100,	CRJU 3	20, CRJL	J 341

- Any degree program that fulfills a REAL area must include at least 9 unique credit hours for each area covered. At least 3 of these 9 credit hours must be at the 300 level or above
- A single major degree program may fulfill no more than three REAL areas for any one student, unless all four REAL areas are fulfilled by accreditation or licensure requirements.
- A single minor or certificate degree program may fulfill no more than two REAL areas.
- Degree program may cover up to two REAL areas using a single prefix.
- All courses documenting the coverage of a REAL area must fulfill all learning outcomes and be designated in that area.
- All courses that document fulfillment of a REAL area within a degree program of study are NOT required to be taught by the department/school. However, departments/schools are expected to formally communicate with other departments about reliance on and inclusion of courses in their degree program plans of study. Indicate this through signature of chair or director of the partnering department or school in the areas below.
- Departments or schools that seek to fulfill REAL areas must acknowledge assessment requirements for those areas. Assessment of degree seeking students is required to be conducted yearly by the department or school offering the degree program.
- If departments or schools want to use a menu of courses to fulfill a particular area, please duplicate the sections below for each REAL area and include information for each course included in the menu of options.
- Please save this file for submission as PROGRAM NAME_ProgramType.docx (Example: Criminal Justice_BS.docx)

By signing, the department/school acknowledges the above conditions and considerations:

Christine K & Hermonn	Date:4/16/20
Dept/School Signature	

Official Program Description:

Please paste the entire official program description from the Radford University catalog in the space within this box. Find those here: <u>https://catalog.radford.edu/</u>

Please note that every department/school will have to submit a catalog change proposal for program that asks the Registrar's Office to insert language about the program coverage of the REAL areas into the official Radford University catalog upon approval.

Radford University

Chemistry, B.S.

Advanced Biochemistry Concentration Advanced Professional Chemist Concentration Biochemistry: Life Sciences and Pre-Health Concentration Forensics Concentration Professional Chemist Concentration

Core Curriculum Requirements (43-47 credits)

See Core Curriculum courses.

Required Major Core Courses (32 credits)

CHEM 111 - General Chemistry I *

CHEM 112 - General Chemistry II *

CHEM 216 - Inorganic Chemistry

CHEM 301 - Organic Chemistry I

CHEM 302 - Organic Chemistry II

CHEM 324 - Analytical Chemistry

CHEM 401 - Physical Chemistry I

CHEM 450 - Career and Professional Development

CHEM 471 - Biochemistry I

Note(s):

* <u>CHEM 111</u> and <u>CHEM 112</u> have been approved for Core Curriculum credit in Natural Sciences.

Math Requirements (8-10 credits)

Option A

MATH 171 - Calculus and Analytic Geometry I

MATH 172 - Calculus and Analytic Geometry II

Option B

MATH 168 - Calculus I with Integrated Precalculus I

MATH 169 - Calculus I with Integrated Precalculus II

MATH 172 - Calculus and Analytic Geometry II

Note(s):

*MATH 168, MATH 169, MATH 171, and MATH 172 have been approved for Core Curriculum credit in

Mathematical Sciences

Biology Requirements (4 credits)

BIOL 105 - Biology for Health Sciences

or

BIOL 132 - Biology of Cells and Microorganisms

B.S. Requirements

B.S. (Non Teaching) Requirements (8 credits)

Bachelor of Science degree without a professional licensure in secondary education requires the following:

PHYS 111 - General Physics and

PHYS 112 - General Physics

or

PHYS 221 - Physics and

PHYS 222 - Physics

Advanced Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students who plan to become professional chemists. It provides an excellent foundation for graduate study in chemistry or related fields and will prepare students for careers in industrial, academic or governmental settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (27-28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 416 - Advanced Inorganic Chemistry

CHEM 424 - Instrumental Methods of Analysis

One additional 300- or higher level course (3-4 credit hours) with CHEM prefix

CHEM 421 - Polymer Chemistry

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students

who plan to become professional chemists. It will prepare students for careers in industrial, academic or governmental settings.

Other Required Courses (14 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

Four additional credits; select from 300- or higher level of courses with a CHEM prefix, including CHEM 481

Biochemistry: Life Sciences and Pre-Health Concentration

This concentration is a rigorous four year program recommended for students planning a career in pharmacy, medicine, dentistry or veterinary medicine. The first three years are designed to optimally prepare students for the pre-entrance aptitude examination (PCAT, MCAT, DAT or GRE).

Other Required Courses (16 credits)

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

8 additional credits of 300- or higher level courses with CHEM or BIOL prefix.

Advanced Biochemistry Concentration

This concentration is a rigorous four-year program recommended for students interested in a career in biochemistry. It provides a comprehensive foundation for graduate study in biochemistry, pharmacology, or related fields and prepares students for careers in industrial, governmental, or academic settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 421 - Polymer Chemistry

CHEM 424 - Instrumental Methods of Analysis

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Forensics Concentration

This concentration is a rigorous four year program recommended for students planning a career in forensic science. It

provides a comprehensive foundation for graduate study in forensic chemistry, forensic science, or

analytical chemistry and prepares students for careers in industrial, governmental, or academic settings.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

CHEM 465 - Forensic Chemistry

CHEM 481 - Undergraduate Research

BIOL 231 - Genetics, Evolution and Development

CRJU 100 - Introduction to Criminal Justice

CRJU 320 - Criminal Investigative Theory

CRJU 341 - Introduction to Forensic Science

Total Credits Needed for Degree 120

(Includes Core Curriculum requirements, required courses and electives. Students should consult with their academic advisors in selecting elective courses to complete the 120 semester hours required for graduation.)

Graduation Requirements

To graduate with a major in chemistry, a student must attain an overall major grade point average of 2.0 or higher. Different courses are considered in the calculation of the major grade point average depending on the student's concentration. All courses required for a given concentration count towards the major grade point average. In cases where additional (beyond those required) electives listed for a given concentration are taken, all count towards the major grade point average calculation.

Teaching Licensure

Students preparing to teach chemistry in the secondary schools are required to take courses in professional education in addition to Core Curriculum courses and courses required by the chemistry major. Interested students should contact the College of Education and Human Development for more information.

SCIENTIFIC AND QUANTITATIVE REASONING

R Area:	Is this course required or an elective for your degree program? \boxtimes Required \square Elective		
Course Prefix: CHEM	Is this course offered within your dept/school? $oxed{P}$ Yes $\ \Box$ No		
Course Number:111	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title: General Chemistry			
1	Course Rotation: 🛛 🖾 Fall 🖾 Spring 🖾 Intersession 🗆 Other (Explain below)		
Credit Hours: 4			
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🛛 Every semester 🖓 Every other year		
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other		
Projected student enrollment per academic year: 432	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required \Box Elective		
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🛛 No		
Course Number: 112	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title: General Chemistry			
II	Course Rotation: 🛛 Fall 🖾 Spring 🖾 Intersession 🗆 Other (Explain below)		
Credit Hours: 4			
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other		
Projected student enrollment per academic year: 240	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
R Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective		
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🛛 No		
Course Number: 301	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title: Organic Chemistry			
1	Course Rotation: 🛛 Fall 🗆 Spring 🖾 Intersession 🗆 Other (Explain below)		
Credit Hours: 4			
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other		
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if		
per academic year: 140	not offered in dept/school:		
-	quired within the Program of Study Approved for Inclusion in the General		
Education Coursework: (CHEM 111, CHEM 112, CHEM 120, CHEM 122, MATH 171, MATH 172, PHYS 111,		
PHYS 112, BIO 132			
,			

R	Ar	ea	:
1.		cu	•

Learning Goal: To apply scientific and quantitative reasoning to questions about the natural world, mathematics, or related areas.

Learning Outcome 1: Students apply scientific and quantitative information to test problems and	Description of learning outcome assessment plan:
draw conclusions.	Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring

	01/14/2020
	the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Learning Outcome 2: Students evaluate the quality of data, methods, or inferences used to generate scientific and quantitative knowledge.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Additional information for REAL Cou	ncil consideration:

HUMANISTIC OR ARTISTIC EXPRESSION

E Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
	\Box At least once every three years \Box Other		
Projected student enrollment			
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if		
. ,	not offered in dept/school:		
E Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: 🛛 Fall 🗋 Spring 🖾 Intersession 🗆 Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: \Box Yes \Box No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
	□ At least once every three years □ Other		
Projected student enrollment	, ,		
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if		
,	not offered in dept/school:		
E Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: 🛛 Fall 🖾 Spring 🖾 Intersession 🗆 Other (Explain below)		
New course: \Box Yes \Box No			
Revised course: \Box Yes \Box No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
Revised course: 🗆 Yes 🛛 No	Intended Frequency: Li Every academic year Li Every semester Li Every other year		

	\Box At least once every three years \Box Other
Projected student enrollment	
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if
	not offered in dept/school:

E Designated Course Required within the Program of Study Approved for Inclusion in the General Education Coursework: (please list at least one, can also be listed above but does not need to be)

E Area:		
Learning Goal: To explore humanistic or artistic expression through inquiry or creativity.		
Learning Outcome 1: Students demonstrate understanding of diverse ideas, languages, products, or processes of humanistic inquiry or artistic expression.	Description of learning outcome assessment plan:	
Learning Outcome 2: Students critically evaluate, synthesize, or create forms of human expression or inquiry.	Description of learning outcome assessment plan:	
Additional information for REAL Council of	consideration:	

CULTURAL OR BEHAVIORAL ANALYSIS

A Area:	Is this course required or an elective for your degree program? Required Elective	
Course Prefix:	Is this course offered within your dept/school? Yes No	
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title:		
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)	
New course: 🗆 Yes 🛛 No		
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year	
	\Box At least once every three years \Box Other	
Projected student enrollment		
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
A Area:	Is this course required or an elective for your degree program? Required Elective	
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No	
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title:		
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)	
New course: 🗆 Yes 🛛 No		
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year	
	\Box At least once every three years \Box Other	
Projected student enrollment		
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
A Area:	Is this course required or an elective for your degree program? Required Elective	
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No	
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title:		
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)	
New course: 🗆 Yes 🛛 No		
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year	
	\Box At least once every three years \Box Other	
Projected student enrollment		
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
A Designated Course Re	quired within the Program of Study Approved for Inclusion in the General	
0	(please list at least one, can also be listed above but does not need to be)	
Euucation Coursework:	(please list at least one, can also be listed above but does not need to be)	

A Area: Learning Goal: To examine the context and interactions of culture(s) and/or behavior(s).		
Learning Outcome 1: Students describe behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:	
Learning Outcome 2: Students analyze the interactions of behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:	
Additional information for REAL Coun	cil consideration:	

APPLIED LEARNING

L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\hfill\square$ Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No	
Course Number: 302	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Organic Chemistry		
11	Course Rotation: 🛛 Fall 🛛 Spring 🖾 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	\Box At least once every three years \Box Other	
Projected student enrollment per academic year: 120	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \Box$ Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No	
Course Number: 324	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Analytical		
Chemistry	Course Rotation: 🛛 Fall 🖾 Spring 🗆 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other	
Projected student enrollment per academic year: 48	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
L Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No	
Course Number: 401	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Physical Chemistry		
1	Course Rotation: 🛛 Fall 🗆 Spring 🗆 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other	
Projected student enrollment per academic year: 24	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:	
L Designated Course Required within the Program of Study Approved for Inclusion in the General		
-	Education Coursework: PHYS 111, PHYS 112, MATH 171, MATH 172, BIO 132	

L Area:

Learning Goal: To explore professional practice through the application of knowledge, skills, and critical reflection.

Learning Outcome 1: Students apply acquired knowledge and skills to	Description of learning outcome assessment plan:
develop professional identity or professional practice.	Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.

	01/14/2020
Learning Outcome 2: Students critically reflect on their learning, abilities, experiences, or role within professional contexts.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's
	assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The
	department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Additional information for REAL Cour	cil consideration:

Are existing material resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional material resources would be needed?

Are existing space resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional space resources would be needed?

Are existing human resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional human resources would be needed?

Department Curriculum Committee Recommendation:	Signature: Christopher J. Monican	Date: 4/16/20
Chair/Dean on Behalf of Dept/School:	Signature: Christine K 7 Hermann	Date:4/16/20
College Curriculum Committee Approval:	Signature:	Date:
Dean/AVP Approval:	Signature:	Date:
REAL Council Recommendation:	Signature:	Date:
Faculty Senate Curriculum Committee Recommendation:	Signature:	Date:
Faculty Senate Approval:	Signature:	Date:
Provost Approval:	Signature:	Date:

REAL Curriculum Program Alignment Proposal

Department or Schoo	: ACSAT Enter dept/school name: Chemistry Date: 03/14/2020	
Degree type: 🛛 🛛 BA 🗆 BBA 🗆 BBN 🗆 BM 🗆 BFA 🗆 BSW 🗆 Minor 🗅 Certificate		
Program: Chemistry-Professional Chemist Concentration		
REAL Area Program Designation Sought (check all that apply): 🛛 🛛 R 🗖 E 🗖 A 🖾 L		
Dept/School Contact:	Dr. Chris Hermann, <u>chermann@radford.edu</u>	
CHEM 111, CHEM 112, CHEM 216, CHEM 301, CHEM 302, CHEM 324, CHEM 350, CHEM 401, CHEM 402, CHEM 424, CHEM 450, CHEM 471, CHEM elective (4 hrs of 300 or 400 level), BIOL 132, MATH 171, MATH 172, PHYS BS/BA Requirements: 111 (or PHYS 221), PHYS 112 (or PHYS 222)		

- Any degree program that fulfills a REAL area must include at least 9 unique credit hours for each area covered. At least 3 of these 9 credit hours must be at the 300 level or above
- A single major degree program may fulfill no more than three REAL areas for any one student, unless all four REAL areas are fulfilled by accreditation or licensure requirements.
- A single minor or certificate degree program may fulfill no more than two REAL areas.
- Degree program may cover up to two REAL areas using a single prefix.
- All courses documenting the coverage of a REAL area must fulfill all learning outcomes and be designated in that area.
- All courses that document fulfillment of a REAL area within a degree program of study are NOT required to be taught by the department/school. However, departments/schools are expected to formally communicate with other departments about reliance on and inclusion of courses in their degree program plans of study. Indicate this through signature of chair or director of the partnering department or school in the areas below.
- Departments or schools that seek to fulfill REAL areas must acknowledge assessment requirements for those areas. Assessment of degree seeking students is required to be conducted yearly by the department or school offering the degree program.
- If departments or schools want to use a menu of courses to fulfill a particular area, please duplicate the sections below for each REAL area and include information for each course included in the menu of options.
- Please save this file for submission as PROGRAM NAME_ProgramType.docx (Example: Criminal Justice_BS.docx)

By signing, the department/school acknowledges the above conditions and considerations:

Official Program Description:

Please paste the entire official program description from the Radford University catalog in the space within this box. Find those here: <u>https://catalog.radford.edu/</u>

Please note that every department/school will have to submit a catalog change proposal for program that asks the Registrar's Office to insert language about the program coverage of the REAL areas into the official Radford University catalog upon approval.

Radford University

Chemistry, B.S.

Advanced Biochemistry Concentration Advanced Professional Chemist Concentration Biochemistry: Life Sciences and Pre-Health Concentration Forensics Concentration Professional Chemist Concentration

Core Curriculum Requirements (43-47 credits)

See Core Curriculum courses.

Required Major Core Courses (32 credits)

CHEM 111 - General Chemistry I *

CHEM 112 - General Chemistry II *

CHEM 216 - Inorganic Chemistry

CHEM 301 - Organic Chemistry I

CHEM 302 - Organic Chemistry II

CHEM 324 - Analytical Chemistry

CHEM 401 - Physical Chemistry I

CHEM 450 - Career and Professional Development

CHEM 471 - Biochemistry I

Note(s):

* <u>CHEM 111</u> and <u>CHEM 112</u> have been approved for Core Curriculum credit in Natural Sciences.

Math Requirements (8-10 credits)

Option A

MATH 171 - Calculus and Analytic Geometry I

MATH 172 - Calculus and Analytic Geometry II

Option B

MATH 168 - Calculus I with Integrated Precalculus I

MATH 169 - Calculus I with Integrated Precalculus II

MATH 172 - Calculus and Analytic Geometry II

Note(s):

*MATH 168, MATH 169, MATH 171, and MATH 172 have been approved for Core Curriculum credit in

Mathematical Sciences

Biology Requirements (4 credits)

BIOL 105 - Biology for Health Sciences

or

BIOL 132 - Biology of Cells and Microorganisms

B.S. Requirements

B.S. (Non Teaching) Requirements (8 credits)

Bachelor of Science degree without a professional licensure in secondary education requires the following:

PHYS 111 - General Physics and

PHYS 112 - General Physics

or

PHYS 221 - Physics and

PHYS 222 - Physics

Advanced Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students who plan to become professional chemists. It provides an excellent foundation for graduate study in chemistry or related fields and will prepare students for careers in industrial, academic or governmental settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (27-28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 416 - Advanced Inorganic Chemistry

CHEM 424 - Instrumental Methods of Analysis

One additional 300- or higher level course (3-4 credit hours) with CHEM prefix

CHEM 421 - Polymer Chemistry

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Professional Chemist Concentration

This concentration is a rigorous four-year program that provides a strong background in chemistry for those students who plan to become professional chemists. It will prepare students for careers in industrial, academic or governmental

settings.

Other Required Courses (14 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

Four additional credits; select from 300- or higher level of courses with a CHEM prefix, including CHEM 481

Biochemistry: Life Sciences and Pre-Health Concentration

This concentration is a rigorous four year program recommended for students planning a career in pharmacy, medicine, dentistry or veterinary medicine. The first three years are designed to optimally prepare students for the pre-entrance aptitude examination (PCAT, MCAT, DAT or GRE).

Other Required Courses (16 credits)

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

8 additional credits of 300- or higher level courses with CHEM or BIOL prefix.

Advanced Biochemistry Concentration

This concentration is a rigorous four-year program recommended for students interested in a career in biochemistry. It provides a comprehensive foundation for graduate study in biochemistry, pharmacology, or related fields and prepares students for careers in industrial, governmental, or academic settings. With this concentration, the student will have an ACS approved degree.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 421 - Polymer Chemistry

CHEM 424 - Instrumental Methods of Analysis

CHEM 472 - Biochemistry II

CHEM 474 - Biochemistry Laboratory

BIOL 231 - Genetics, Evolution and Development

CHEM 481 - Undergraduate Research

CHEM 485 - Capstone Research Experience

Forensics Concentration

This concentration is a rigorous four year program recommended for students planning a career in forensic science. It

provides a comprehensive foundation for graduate study in forensic chemistry, forensic science, or

analytical chemistry and prepares students for careers in industrial, governmental, or academic settings.

Other Required Courses (28 credits)

CHEM 350 - Chemistry Research Methods

CHEM 402 - Physical Chemistry II

CHEM 424 - Instrumental Methods of Analysis

CHEM 465 - Forensic Chemistry

CHEM 481 - Undergraduate Research

BIOL 231 - Genetics, Evolution and Development

CRJU 100 - Introduction to Criminal Justice

CRJU 320 - Criminal Investigative Theory

CRJU 341 - Introduction to Forensic Science

Total Credits Needed for Degree 120

(Includes Core Curriculum requirements, required courses and electives. Students should consult with their academic advisors in selecting elective courses to complete the 120 semester hours required for graduation.)

Graduation Requirements

To graduate with a major in chemistry, a student must attain an overall major grade point average of 2.0 or higher. Different courses are considered in the calculation of the major grade point average depending on the student's concentration. All courses required for a given concentration count towards the major grade point average. In cases where additional (beyond those required) electives listed for a given concentration are taken, all count towards the major grade point average calculation.

Teaching Licensure

Students preparing to teach chemistry in the secondary schools are required to take courses in professional education in addition to Core Curriculum courses and courses required by the chemistry major. Interested students should contact the College of Education and Human Development for more information.

SCIENTIFIC AND QUANTITATIVE REASONING

SCIENTIFIC AND QUANTI		
R Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $oxtimes$ Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🛛 No	
Course Number:111	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: General Chemistry		
1	Course Rotation: 🛛 🖾 Fall 🖾 Spring 🖾 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🛛 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other	
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if	
per academic year: 432	not offered in dept/school:	
R Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🗖 No	
Course Number: 112	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: General Chemistry		
, ,	Course Rotation: 🛛 Fall 🛛 Spring 🖾 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other	
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if	
per academic year: 240	not offered in dept/school:	
R Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective	
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🗖 No	
Course Number: 301	If no, collaborating dept/school must also complete the remaining elements, and must sign below.	
Course Title: Organic Chemistry		
1	Course Rotation: 🛛 🖾 Fall 🗆 Spring 🖾 Intersession 🗆 Other (Explain below)	
Credit Hours: 4		
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year	
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other	
Projected student enrollment	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if	
per academic year: 140	not offered in dept/school:	
R Designated Course Rec	quired within the Program of Study Approved for Inclusion in the General	
•	CHEM 111, CHEM 112, CHEM 120, CHEM 122, MATH 171, MATH 172, PHYS 111,	
	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	
PHYS 112		

R Area:

Learning Goal: To apply scientific and quantitative reasoning to questions about the natural world, mathematics, or related areas.

,	
Learning Outcome 1: Students apply scientific and quantitative information to test problems and draw conclusions.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will
	develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The
	department's assessment committee will then continue monitoring

	01/14/2020
	the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Learning Outcome 2: Students evaluate the quality of data, methods, or inferences used to generate scientific and quantitative knowledge.	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.
Additional information for REAL Cou	ncil consideration:

HUMANISTIC OR ARTISTIC EXPRESSION

E Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🗖 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: 🛛 Fall 🗋 Spring 🗋 Intersession 🗋 Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year		
	\Box At least once every three years \Box Other		
Projected student enrollment			
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
E Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: 🛛 Fall 🗋 Spring 🗋 Intersession 🗋 Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year		
	\Box At least once every three years \Box Other		
Projected student enrollment			
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if		
	not offered in dept/school:		
E Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? Yes No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: 🛛 Fall 🗋 Spring 🗋 Intersession 🗋 Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		

	□ At least once every three years □ Other	
Projected student enrollment		
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if	
	not offered in dept/school:	
C Design at a Course Descripted within the Description of Church Agencies of fair heads in the Course of		

E Designated Course Required within the Program of Study Approved for Inclusion in the General Education Coursework: (please list at least one, can also be listed above but does not need to be)

E Area:			
Learning Goal: To explore humanistic or artistic expression through inquiry or creativity.			
Learning Outcome 1: Students demonstrate understanding of diverse ideas, languages, products, or processes of humanistic inquiry or artistic expression.	Description of learning outcome assessment plan:		
Learning Outcome 2: Students critically evaluate, synthesize, or create forms of human expression or inquiry.	Description of learning outcome assessment plan:		
Additional information for REAL Council of	consideration:		

CULTURAL OR BEHAVIORAL ANALYSIS

A Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: 🗌 Fall 🔲 Spring 🔲 Intersession 🗆 Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year		
	\Box At least once every three years \Box Other		
Projected student enrollment			
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
A Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
	\Box At least once every three years \Box Other		
Projected student enrollment			
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
A Area:	Is this course required or an elective for your degree program? Required Elective		
Course Prefix:	Is this course offered within your dept/school? 🗆 Yes 🛛 No		
Course Number:	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title:			
Credit Hours:	Course Rotation: \Box Fall \Box Spring \Box Intersession \Box Other (Explain below)		
New course: 🗆 Yes 🛛 No			
Revised course: 🗆 Yes 🛛 No	Intended Frequency: \Box Every academic year \Box Every semester \Box Every other year		
	\Box At least once every three years \Box Other		
Projected student enrollment			
per academic year:	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
A Designated Course Re	quired within the Program of Study Approved for Inclusion in the General		
0	(please list at least one, can also be listed above but does not need to be)		
Euucation Coursework:	(please list at least one, can also be listed above but does not need to be)		

A Area: Learning Goal: To examine the	context and interactions of culture(s) and/or behavior(s).
Learning Outcome 1: Students describe behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:
Learning Outcome 2: Students analyze the interactions of behaviors, beliefs, cultures, social institutions, and/or environments.	Description of learning outcome assessment plan:
Additional information for REAL Coun	cil consideration:

APPLIED LEARNING

L Area:	Is this course required or an elective for your degree program? $oxtimes$ Required $\ \Box$ Elective		
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No		
Course Number: 302	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title: Organic Chemistry			
	Course Rotation: 🛛 Fall 🛛 Spring 🖾 Intersession 🗆 Other (Explain below)		
Credit Hours: 4			
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other		
Projected student enrollment per academic year: 120	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
L Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective		
Course Prefix: CHEM	Is this course offered within your dept/school? 🛛 Yes 🛛 No		
Course Number: 324	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title: Analytical			
Chemistry	Course Rotation: 🛛 Fall 🖾 Spring 🗆 Intersession 🗆 Other (Explain below)		
Credit Hours: 4			
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other		
Projected student enrollment per academic year: 48	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
L Area:	Is this course required or an elective for your degree program? 🛛 Required 🛛 Elective		
Course Prefix: CHEM	Is this course offered within your dept/school? ⊠ Yes □ No		
Course Number: 401	If no, collaborating dept/school must also complete the remaining elements, and must sign below.		
Course Title: Physical Chemistry			
1	Course Rotation: 🛛 Fall 🗆 Spring 🗆 Intersession 🗆 Other (Explain below)		
Credit Hours: 4			
New course: 🗆 Yes 🛛 No	Intended Frequency: 🛛 Every academic year 🗆 Every semester 🗆 Every other year		
Revised course: 🗆 Yes 🛛 No	□ At least once every three years □ Other		
Projected student enrollment per academic year: 24	Signature of collaborating chair/director indicating acknowledgement for inclusion and designation if not offered in dept/school:		
· · ·	uired within the Program of Study Approved for Inclusion in the General		
-			
Education Coursework: PHYS 111, PHYS 112, MATH 171, MATH 172			

L Area:

Learning Goal: To explore professional practice through the application of knowledge, skills, and critical reflection.

Learning Outcome 1: Students apply acquired knowledge and skills to	Description of learning outcome assessment plan:
develop professional identity or professional practice.	Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.

Learning Outcome 2: Students critically reflect on their learning, abilities, experiences, or role within professional contexts. Additional information for REAL Coun	Description of learning outcome assessment plan: Data will be collected from the REAL General Studies Minor assessments conducted by the university in the student's senior year. Once the data is received in the department the department's assessment committee will review the data to determine if corrective action is necessary. If needed the assessment committee will develop an improvement plan in combination with faculty teaching classes in this area and the department's curriculum committee. The agreed upon changes will be incorporated into the classes. The department's assessment committee will then continue monitoring the collected assessment data to determine the effectiveness of the corrective action and determine further actions if necessary.

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Are existing material resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional material resources would be needed?

Are existing space resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional space resources would be needed?

Are existing human resources adequate to support this program alignment proposal? \boxtimes Yes \square No If not, what additional human resources would be needed?

Department Curriculum Committee Recommendation:	Signature: Christopher J. Monican	Date: 4/1620
Chair/Dean on Behalf of Dept/School:	Signature: Christine K 7 Hermann	Date: 4/16/20
College Curriculum Committee Approval:	Signature:	Date:
Dean/AVP Approval:	Signature:	Date:
REAL Council Recommendation:	Signature:	Date:
Faculty Senate Curriculum Committee Recommendation:	Signature:	Date:
Faculty Senate Approval:	Signature:	Date:
Provost Approval:	Signature:	Date: