



UNIVERSITY of WASHINGTON

Michael K. Young
President

May 15, 2014

Dean Elaine Scott
School of Science, Technology, Engineering and Mathematics
University of Washington, Bothell
Box 358538

Dear Elaine:

Based upon the recommendations of the Executive Council, the General Faculty Organization has recommended approval of a Bachelor of Arts degree in Chemistry; a Bachelor of Science degree in Chemistry; and an option in Biochemistry within the Bachelor of Science degree in Chemistry. A copy of the approval is attached.

I am writing to inform you that the School of Science, Technology, Engineering, and Mathematics is authorized to specify these requirements beginning autumn quarter 2014.

The new requirements should be incorporated in printed statements and in individual department websites as soon as possible. The *General Catalog* website will be updated accordingly by the Registrar's Office.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Michael K. Young".

Michael K. Young
President

Enclosure

cc: Dr. Dan Jaffe (with enclosure)
Mr. Robert Corbett (with enclosure)
Ms. Virjean Edwards (with enclosure)



UNIVERSITY OF WASHINGTON

CREATING AND CHANGING UNDERGRADUATE ACADEMIC PROGRAMS

APR 01 2014

OFFICE USE ONLY

Control #

BCHEM-2014023

After college/school/campus review, send a signed original and 1 copy to the Curriculum Office/FCAS, Box 355850.

For information about when and how to use this form: <http://depts.washington.edu/uwcr/1503instructions.pdf>

College/Campus	UW Bothell	Department/Unit	School of STEM, Physical Sciences Division	Date	1/23/2014
New Programs					
<input type="checkbox"/> Leading to a Bachelor of _____ degree.					
<input checked="" type="checkbox"/> Leading to a Bachelor of <u>Arts and Science</u> degree with a major in <u>Chemistry</u>					
<input checked="" type="checkbox"/> Leading to a <u>Biochemistry</u> Option within the existing major in <u>B.S. in Chemistry</u> .					
<input type="checkbox"/> Leading to a minor in _____					
Changes to Existing Programs					
<input type="checkbox"/> New Admission Requirements for the Major in _____ within the Bachelor of _____.					
<input type="checkbox"/> Revised Admission Requirements for the Major in _____ within the Bachelor of _____.					
<input type="checkbox"/> Revised Program Requirements for the Major in _____ within the Bachelor of _____.					
<input type="checkbox"/> Revised Requirements for the Option in _____ within the major in _____.					
<input type="checkbox"/> Revised Requirements for the Minor in _____.					
Other Changes					
<input type="checkbox"/> Change name of program from _____ to _____.					
<input type="checkbox"/> Change delivery method or location of program.					
<input type="checkbox"/> New or Revised Continuation Policy for _____.					
<input type="checkbox"/> New Honors Requirements for _____.					
<input type="checkbox"/> Eliminate program in _____.					
Proposed Effective Date: Quarter: <input checked="" type="checkbox"/> Autumn <input type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer Year: 2014					
Contact Person: Dan Jaffe		Phone: 2-5357		Email: djaffe@uw.edu	
Box: 358538					
EXPLANATION OF AND RATIONALE FOR PROPOSED CHANGE					
For new program, please include any relevant supporting documentation such as student learning outcomes, projected enrollments, letters of support and departmental handouts. (Use additional pages if necessary).					
<p>New degree is part of UWB initiative in STEM majors. Chemistry majors are typically one of the largest STEM majors at most universities. For further information see attached documentation.</p>					
OTHER DEPARTMENTS AFFECTED					
List all departments/units/ or co-accredited programs affected by your new program or changes to your existing program and acquire the signature of the chair/director of each department/unit listed. Attach additional page(s) if necessary. *See online instructions.					
Department/Unit:	Chair/Program Director:			Date:	
Department/Unit:	Chair/Program Director:			Date:	



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College/Campus	UW Bothell	Department/Unit	School of STEM, Physical Sciences Division	Date	1/23/2014
New Programs					
<input checked="" type="checkbox"/> Leading to a Bachelor of <u>Science</u> in <u>Chemistry</u> degree.					
<input type="checkbox"/> Leading to a Bachelor of _____ degree with a major in _____.					
<input checked="" type="checkbox"/> Leading to a <u>Biochemistry</u> Option within the existing major in <u>B.S. in Chemistry</u> .					
<input type="checkbox"/> Leading to a minor in _____.					
Changes to Existing Programs					
<input type="checkbox"/> New Admission Requirements for the Major in _____ within the Bachelor of _____.					
<input type="checkbox"/> Revised Admission Requirements for the Major in _____ within the Bachelor of _____.					
<input type="checkbox"/> Revised Program Requirements for the Major in _____ within the Bachelor of _____.					
<input type="checkbox"/> Revised Requirements for the Option in _____ within the major in _____.					
<input type="checkbox"/> Revised Requirements for the Minor in _____.					
Other Changes					
<input type="checkbox"/> Change name of program from _____ to _____.					
<input type="checkbox"/> Change delivery method or location of program.					
<input type="checkbox"/> New or Revised Continuation Policy for _____.					
<input type="checkbox"/> New Honors Requirements for _____.					
<input type="checkbox"/> Eliminate program in _____.					
Proposed Effective Date: Quarter: <input checked="" type="checkbox"/> Autumn <input type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer Year: 2014					
Contact Person: Dan Jaffe		Phone: 2-5357		Email: djaffe@uw.edu	
				Box: 358538	
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For new program, please include any relevant supporting documentation such as student learning outcomes, projected enrollments, letters of support and departmental handouts. <i>(Use additional pages if necessary).</i>					
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OTHER DEPARTMENTS AFFECTED					
List all departments/units/ or co-accredited programs affected by your new program or changes to your existing program and acquire the signature of the chair/director of each department/unit listed. Attach additional page(s) if necessary. *See online instructions.					
Department/Unit:		Chair/Program Director:		Date:	
Chemistry		Paul Bl		3/26/14	
Department/Unit:		Chair/Program Director		Date:	

CATALOG COPY

Catalog Copy as currently written. Include only sections/paragraphs that would be changed if your request is approved. Please cross out or otherwise highlight any deletions.

Chemists study the molecular nature of all matter on earth and in the universe. The UWB Bachelor of Science in Chemistry will prepare students for a wide array of careers in industry, academia or government positions. Many Chemistry students choose to continue their education in graduate programs or medical school. Our degree features hands-on experience in research using an array of modern instrumentation. Coursework includes general, analytical, organic, physical, environmental and bio-chemistry.

Students in this major can also choose to complete a Biochemistry option, which focuses on developing an understanding of the molecular nature of life and biologically relevant molecules.

PROPOSED CATALOG COPY

Reflecting requested changes (Include exact wording as you wish it to be shown in the printed catalog. Please underline or otherwise highlight any additions. If needed, attach a separate, expanded version of the changes that might appear in department publications). Please note: all copy will be edited to reflect uniform style in the General Catalog.

APPROVALS

Chair/Program Director: <i>Daniel A. Jaffe</i>	Date: 1/23/2014
College/School/Campus Curriculum Committee:	Date:
Dean/Vice Chancellor: <i>Chair P. Scott</i>	Date: 1/23/14
Faculty Council on Academic Standards/ General Faculty Organization/Faculty Assembly Chair: <i>Jerelyn Resnick</i> 3-13-14	Date:
POST TRI-CAMPUS APPROVAL (when needed)	
Faculty Council on Academic Standards/ General Faculty Organization/Faculty Assembly Chair: <i>Jerelyn Resnick</i> Ap. 30, 2014	Date:




UNIVERSITY OF WASHINGTON

BOTHELL

Office of the General Faculty Organization

To: Bjong Wolf Yeigh, Chancellor

From: Jerelyn Resnick, Chair, GFO Executive Council 

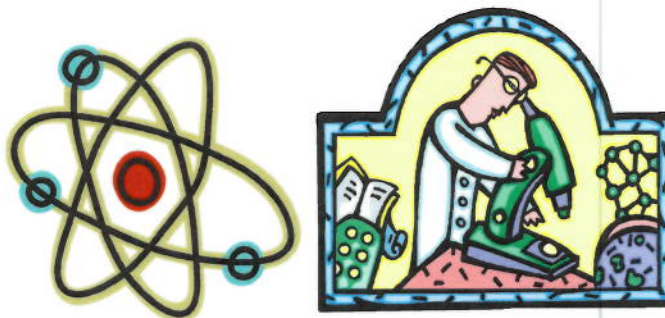
Copy: Susan Jeffords, Vice Chancellor for Academic Affairs,
Kari Lerum, Chair, GFO

RE: GFO Executive Council Endorsement to Forward the STEM Proposal for a BS and BA in Chemistry to the UW Registrar for Tri-campus Review.

Date: February 25, 2014

On Tuesday, February 25, 2014, the General Faculty Organization's Executive Council endorsed forwarding the STEM proposal for a BS and BA in Chemistry to the UW Registrar for Tri-campus Review.

**University of Washington Bothell
School of Science, Technology, Engineering and Mathematics
Physical Sciences Division**



Application for New Degrees:

**Bachelor of Science in Chemistry
Bachelor of Science in Chemistry, Biochemistry Option
Bachelor of Arts in Chemistry**

January 2014

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I. Degree Program Description and Rationale

Chemistry/Biochemistry is one of the largest STEM majors at most colleges and universities. Because of this, UW Bothell is proposing to offer a Bachelor of Science (BS) degree in Chemistry and a Bachelor of Arts (BA) degree in Chemistry starting in Fall 2014. Chemistry encompasses a broad range of sub-disciplines including inorganic, organic, physical, analytical, biochemistry and environmental. Our degrees will offer coursework in each of these areas.

The BS degree will offer students a curriculum that includes all of the key elements in chemistry and is consistent with the recommendations of the American Chemical Society (ACS). The degree can include a specialization in environmental chemistry, materials chemistry or biochemistry. These topics fit well with the UWB interdisciplinary mission and other teaching and research emphases on campus. As part of the BS degree, students may also choose a biochemistry option, which would appear on the students' transcripts.

The BA in Chemistry degree will allow students to get a focused STEM degree that includes a career track aimed at STEM education. In consort with the UWB Education program, BA Chemistry students will have the opportunity to complete a Teaching & Learning minor and continue on to get a Washington State secondary teacher certification in Chemistry. UWB STEM graduates will be noted not only for their expertise in their chosen STEM field, but also for their understanding of the application of chemistry courses to disciplines other than their own.

In keeping with the interdisciplinary focus of UW Bothell's programs, the BS and BA Chemistry curricula will inform and expose students to the interdisciplinary nature of STEM fields and programs along with training them to solve various technical problems for the general good. At UWB, graduates in chemistry will have an education that fosters creative thinking, which in turn will allow them to address critical challenges and issues in STEM subjects. Furthermore, they will acquire skills that will enable them to work effectively by solving problems and communicating results to a growing and diverse world of individuals.

Within 5 years of the degree startup, we will apply for full program approval from the ACS (see requirements at <http://www.acs.org/content/acs/en/education/policies.html>). Once obtained, this approval will allow the UWB to certify that our BS Chemistry graduates have completed an ACS-approved program.

II. Relationship to Institutional and Unit Priorities

In March 2013, the University of Washington Bothell announced the creation of its School of Science, Technology, Engineering and Mathematics, in accord with the strategic plan prepared in 2009 by the STEM Taskforce. The report listed six STEM majors, four of which have already been developed and implemented since 2009. The four majors already developed are Biology, Climate Science, Electrical Engineering, and Mathematics, and these enroll more than 200 students. The two programs that are currently being developed are those in Chemistry and in Mechanical Engineering. The launch of these two programs during the fall of 2014 will coincide with the opening of UW-3, a new building for STEM disciplines on the UWB campus. UW Bothell is thus intentionally addressing a statewide need to produce graduates in STEM fields.

The emphasis of the Chemistry major with specializations in biochemistry, environmental chemistry, and materials chemistry fits well with the campus mission of interdisciplinary teaching and research. Environmental chemistry students will be able to use the campus wetlands, which serve as a natural lab for environmental professionals as well as students. The Washington State Department of Ecology accredits over 200 environmental analyses labs and facilities within the state (see <http://www.ecy.wa.gov/programs/eap/labs/documents/AllAccreditedLabListInternet.pdf>), with the Puget Sound region offering the greatest opportunities for employment in environmental fields. At UWB, the Chemistry major will also provide support to the majors-level programs in Environmental Science and Climate Science that already exist.

The biochemistry track within the Chemistry major will also support other UWB majors, such as that in Biology, thereby providing greater opportunities for UWB STEM majors to find employment, especially in this region. The north Puget Sound region is home to a burgeoning center for biotechnology, which would benefit from graduates of the biochemistry track and offer them employment opportunities. For example, the Snohomish County Economic Development Office states,

Snohomish County is home to many premier biotechnology and medical device companies, developing methods for diagnosing and treating diseases and illnesses such as cancer, AIDS, cystic fibrosis and rheumatoid arthritis (Snohomish County Economic Development, <http://www.snocobiz.org/page.php?id=113>).

The specialization courses in materials chemistry will be integrated with those in the new major of mechanical engineering that is currently being developed. This specialization will also support the growing nanotechnology industry by supplying trained students with well-rounded skills to the numerous companies pursuing research in nanomaterials along the I-5 corridor of Washington State.

III. National and State Demand

There are 25,000 “acute” unfilled jobs in Washington today—jobs that have been unfilled for three months or more due to a lack of qualified candidates. Eighty percent of these jobs are in high-demand health care and high-skill STEM (science, technology, engineering and math) disciplines.¹

A. National Demand

At present, the national demand for chemists is expected to grow by 4 percent, as they will be needed in scientific research and development along with monitoring the quality of chemical products and processes.² Research in environmental fields will offer many new opportunities for chemists, as chemical manufacturing industries will continue to annually invest billions of dollars to develop technologies and processes that will reduce pollution and improve energy efficiency at manufacturing facilities.

In addition, the development of improved battery technologies and alternative energy sources will likely lead to greater demand for chemists and material scientists. Chemists will continue to be needed to monitor pollution levels at manufacturing facilities and ensure compliance with local, state and federal

¹Boston Consulting Group/WA Roundtable (BCG), *Great Jobs Within Our Reach*, March 2013, p. 4.

²BCG, p. 4.

environmental regulations.³ In the American Chemical Society's annual job survey for March 2012, over 90% of chemists were employed full time in the chemical industry, with an additional 6% employed part time or in post-doctoral positions. Only 4% of chemists were actively looking for full-time employment.⁴ The Bureau of Labor Statistics employment survey³ has shown that employment for chemists, environmental scientists and biochemists has grown considerably in the past several years.

Table I: U.S. Employment Data, 2006–2012³

	Number Employed		Percent Increase
	2006	2012	
Chemists	80,500	84,950	6%
Chemical technicians	59,900	61,300	2%
Environmental scientists	77,720	84,240	8%
Biochemists and biophysicists	18,680	26,410	41%

B. Salaries

An entry-level salary for chemists with bachelor degrees was \$47,000 in 2012. The median salary for chemists with bachelor degrees and with five or more years of experience is \$73,850.⁵

Table II: Salary Data for Chemists, 2012

Location	Annual Wages				
	10%	25%	Median	75%	90%
United States	\$40,200	\$51,100	\$73,850	\$93,300	\$117,900
Washington State	\$45,500	\$59,100	\$74,100	\$94,300	\$115,600

While salary is determined by several factors including education, employment sector and length of experience, various other factors need to be considered as well. Some of the other factors that influence salary are type of work, specialization in work, geographic region and gender.⁶

Table III: Full-Time Salaries for Chemists in All Job Categories as of March 1, 2012

³ Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2012–13 Edition, <http://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materials-scientists.htm#tab-6>, accessed January 2014.

⁴ Chemical and Engineering News, Salary & Employment Survey For Chemists, <http://cen.acs.org/articles/90/i39/Salary-Employment-Survey-Chemists.html>, accessed in 2013.

⁵ Occupation Outlook Handbook, <http://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materials-scientists.htm#tab-5>, accessed April 2013.

⁶ Occupation Outlook Handbook, <http://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materials-scientists.htm#tab-5>, accessed April 2013.

Education Level	Median Salary
All Degrees	\$92,000
Bachelor's	\$73,900
Master's	\$85,000
Doctorate	\$100,600

C. Washington State Demand

The employment trends for chemists and similar professionals in Washington State do not precisely mirror those nationwide.⁷ The Employment Security Department of Washington State (ESD) reports employment growth for chemists statewide including a balanced growth and demand in King County. In addition, there has been considerable growth and demand for environmental scientists throughout the state as well as in King County. However, the demand for biochemists has remained balanced, although statewide growth is being projected.

The ESD also classifies the occupations listed in Table IV as “green jobs.” According to the ESD, a green job is one that promotes environmental protection and generates clean energy. This classification implies that “green economy” activities and technologies are increasing the demand for environmentally friendly jobs by shaping the work and worker requirements for occupational performance, and consequently creating new and emerging fields of employment. Green economy activities and technologies are likely to increase employment demand, and at the same time not lead to any significant changes in the type of work and/or worker requirements.

Table IV: Employment Projections for Washington, 2010–2020

	Number Employed		Average Annual Growth	Annual Job Openings
	2010	2020		
Chemists	2,131	2,557	2%	131
Chemical technicians	806	946	2%	35
Environmental scientists	4,193	4,906	2%	235
Biochemists and biophysicists	235	298	3%	14

In addition to these positions, the U.S. Department of Education tracks needs for secondary teachers across the U.S.⁸ In their report, a shortage of secondary chemistry teachers has been consistently reported

⁷ Employment Security Department of Washington State (ESD), <https://fortress.wa.gov/esd/employmentdata/reports-publications/occupational-reports/occupations-in-demand>, accessed March 2013.

⁸ U.S. Department of Education, Office of Postsecondary Education, Teacher Shortage Areas Nationwide Listing 1990–1991 through 2013–2014, March 2013, <http://www2.ed.gov/about/offices/list/oep/pol/tsa.pdf>, accessed in 2013.

statewide for the period of 2007 through the present. Thus, we expect that our BA Chemistry majors with a secondary teaching certification will be in high demand.

IV. BS/BA Program Objectives and Learning Goals

Learning Goals for Bachelor of Science in Chemistry

1. Develop a rigorous understanding of the atomic and molecular nature of all matter, including atomic structure, bonding, energetics, equilibrium and other related topics.
2. Develop a rigorous understanding of the interactions of matter with energy and light.
3. Thoroughly understand the quantized nature of the atom along with atomic and molecular concepts and processes related to it.
4. Apply the appropriate mathematical principles and concepts to solve quantitative chemical problems on a wide array of topics.
5. Display working knowledge and practical skills in the use of modern lab instrumentation.
6. Be knowledgeable about safe laboratory practices, applying them consistently in different situations, and be able to critically analyze and evaluate the data and results procured from practical lab work.
7. Effectively communicate in oral and written forms, making use of the correct terminologies and vocabulary, to diverse scientific and non-scientific audiences.
8. Be able to design research projects and apply the theoretical knowledge and practical skills towards problems of social and human significance.
9. Apply the skills gained in chemistry to a variety of related subjects in the physical sciences and in other fields and disciplines.
10. Have a thorough understanding of ethical behavior and practices as applied to various STEM fields and disciplines.

Learning Goals for Bachelor of Arts in Chemistry

1. Develop a rigorous understanding of the atomic and molecular nature of all matter, including atomic structure, bonding, reaction energetics, equilibrium and other related topics.
2. Develop a rigorous understanding of the interactions of matter with energy and light.
3. Thoroughly understand the quantized nature of the atom along with atomic and molecular concepts and processes related to it.
4. Apply the appropriate mathematical principles and concepts to solve quantitative chemical problems on a wide array of topics.

5. Be knowledgeable about safe laboratory practices, applying them consistently in different situations, and be able to critically analyze and evaluate the data and results procured from practical lab work.
6. Effectively communicate in oral and written forms, making use of the correct terminologies and vocabulary, to scientific and non-scientific audiences.
7. Have a thorough understanding of ethical behavior and practices as applied to various STEM fields and disciplines.
8. Be able to develop tools and create an environment that effectively facilitates instruction of chemistry in particular and of STEM subjects in general.

V. Curriculum

A total of 180-quarter credits are required to complete the Chemistry major. All major requirements and prerequisite courses must be completed with a minimum grade of 2.0. Regardless of the number of Chemistry courses taken at another institution, at least 45 of the last 60 credits must be taken in residence at UW Bothell. Admission to this major is competitive, and completion of prerequisites does not guarantee admission. Requirements are subject to change. Students should consult an adviser about their academic plan.

The curriculum is described below for the BS (with and without the biochemistry option) and the BA degrees. While both degrees provide significant rigor in Chemistry, there is sufficient flexibility to accommodate university requirements and courses in other fields. For both the BS and BA degrees, all required BCHEM courses must be completed with a grade of 2.0 or above.

A. Course Requirements for the BS in Chemistry

BS Chemistry Requirements	Credits	BS Chemistry with Biochem Option Requirements	Credits
<u>Required Lower Division Courses</u>		<u>Required Lower Division Courses</u>	
General Chemistry (BCHEM 143, 153, 163, with labs BCHEM 144, 154, 164)	18	General Chemistry (BCHEM 143, 153, 163, with labs BCHEM 144, 154, 164)	18
English Composition	5	English Composition	5
Calculus I, II and III (BCUSP 124,125, 126, or STMATH 124,125,126)	15	Calculus I, II and III (BCUSP 124,125, 126, or STMATH 124,125,126)	15
Physics (BPHYS 121,122, 123)	15	Physics (BPHYS 121,122, 123)	15
Organic Chemistry (BCHEM 237, 238, 239, with labs BCHEM 241, 242)	18	Organic Chemistry (BCHEM 237, 238, 239, with labs BCHEM 241, 242)	18
Total	71	Total	71
<u>Chemistry Core (300-level and above)</u>		<u>Chemistry Core (300-level and above)</u>	
Inorganic Chemistry I and II (BCHEM 312, 313)	6	Quant. Envir. Analysis (W, BCHEM 315)	5
Quant. Envir. Analysis (W, BCHEM 315)	5	Physical Chemistry I, II, (BCHEM 401,402)	8
Physical Chemistry I, II, III (BCHEM 401,402,403)	12	Physical Chemistry Lab (BCHEM 404)	4
Physical Chemistry Lab (BCHEM 404)	4	Instrumental Analysis	5
Instrumental Analysis	5	Investigative Chemistry I and II (3 credits per course) or Indept. Research in Chem.	6
Investigative Chemistry I and II (3 credits per course) or Independent Research in Chemistry	6	Total	28
Total	38	<u>Other required courses for Biochemistry option</u>	
<u>Other required Courses for BS Chemistry major</u>		Mathematics courses at the 300 level (STMATH 307, 308, 324 or 341)	5
Mathematics courses at the 300 level (STMATH 307, 308, 324 or 341)	5	Biology 180, 200	10
Other upper division (300/400 level) chemistry courses	10	Biochemistry I and II (BCHEM 364, and 365)	10
Biochemistry I (BCHEM 364)	5	Molecular Biology (BBIO 366)	5
Other upper division STEM courses	5	Biochemistry Lab	3
		Other upper division (300/400 level) chemistry courses	5
Total for degree	134	Total for degree	137
<u>Other UW requirements and electives (I+S, VLPA, Diversity and additional writing) or general electives</u>	46	<u>Other UW requirements and electives (I+S, VLPA, Diversity and additional writing) or general</u>	43
<u>Total credits for degree</u>	180	<u>Total credits for degree</u>	180

Note: Incoming freshmen enroll in the Discovery Core sequence to satisfy some university requirements on writing, composition, I+S, NW and VLPA. Transfer students would normally have all required lower division courses.

Example Schedule for BS in Chemistry

Year	Autumn Quarter	Winter Quarter	Spring Quarter	Total Credits
1	Discovery Core – I (5) Calculus – I (5) General Chemistry – I (4) General Chem Lab – I (2) Total = 16	Discovery Core – II (5) Calculus – II (5) General Chemistry – II (4) General Chem Lab – II (2) Total = 16	Discovery Core – III (5) Calculus – III (5) General Chemistry – III (4) General Chem Lab – III (2) Total = 16	48
2	Physics – I (5) Organic Chemistry – I (4) 300-level Math (5) Total = 14	Physics – II (5) Organic Chemistry – II (4) Organic Chem Lab – I (3) English Composition (5) Total = 17	Physics – III (5) Organic Chemistry – III (4) Organic Chem Lab – II (3) General Elective (3) Total = 15	46
3	Physical Chemistry – I (4) Quant Envir. Analysis (5) General Elective (5) Total = 14	Physical Chemistry – II (4) Instrumental Analysis (5) Inorganic Chemistry – I (3) General Elective (5) Total = 17	Physical Chemistry – III (4) Physical Chem Lab (4) Inorganic Chemistry – II (3) General Elective (3) Total = 14	45
4	Chemistry Elective (5) Chemistry Elective (5) General Elective (5) Total = 15	Chemistry Elective (5) Investigative Chem– I (3) General Elective (5) Total = 13	Chemistry Elective (5) Investigative Chem –II (3) General Elective (5) Total = 13	41
Total Credits				180

Example schedule for BS in Chemistry with Biochemistry Option

Year	Autumn Quarter	Winter Quarter	Spring Quarter	Total Credits
1	Discovery Core – I (5) Calculus – I (5) General Chemistry – I (4) General Chem Lab – I (2) Total = 16	Discovery Core – II (5) Calculus – II (5) General Chemistry – II (4) General Chem Lab – II (2) Total = 16	Discovery Core – III (5) Calculus – III (5) General Chemistry – III (4) General Chem Lab – III (2) Total = 16	48
2	Physics – I (5) Organic Chemistry – I (4) Intro Biology I (5) Total = 14	Physics – II (5) Organic Chemistry – II (4) Organic Chem Lab – I (3) Intro Biology II (5) Total = 17	Physics – III (5) Organic Chemistry – III (4) Organic Chem Lab – II (3) General Elective (3) Total = 15	46
3	Quant Environ Anal (5) Biochemistry I (5) Biochemistry Lab (3) General Elective (3) Total = 16	Instrumental Analysis (5) Biochemistry II (5) Inorganic Chemistry – I (3) Total = 13	Biochemistry III (5) English Composition (5) 300 Level Math (5) Total = 15	44
4	Advanced Biochem Lab (4) Physical Chemistry – I (4) General Elective (5) Total = 13	Physical Chemistry – II (4) Chemistry Elective (5) Investigative Chem – I (3) General Elective (2) Total = 14	Physical Chemistry Lab (4) Investigative Chem – II (3) General Elective (5) General Elective (3) Total = 15	42
Total Credits				180

B. Course Requirements for the BA in Chemistry

The BA in Chemistry will appeal to a wide variety of students interested in a broader and more interdisciplinary Chemistry experience. For example, students could pursue a science teaching career by getting most of the required coursework for a secondary certification. The table below shows the required coursework for a student pursuing a BA degree in Chemistry. This example schedule is appropriate for a student who wishes to pursue a secondary teaching certification in Chemistry by getting a minor in Teaching & Learning.

BA Chemistry Requirements	Credits
<u>Required Lower Division Courses</u>	
English Composition	5
Calculus I, II and III (BCUSP 124,125,126, or STMATH 124, 125, 126)	15
General Chemistry (BCHEM 143, 153, 163, with labs BCHEM 144, 154, 164)	18
Physics (BPHYS 121, 122, 123)	15
Organic Chemistry (BCHEM 237, 238, 239, with labs BCHEM 241, 242)	18
Total	71
<u>Chemistry Core (300-level and above)</u>	
Inorganic Chemistry I (BCHEM 312)	3
Quantitative Environmental Analysis (W, BCHEM 315)	5
Physical Chemistry I, II (BCHEM 401,402)	8
Investigative Chemistry I (3 credits) or Independent Research in Chemistry	3
Undergraduate mentoring in Chemistry	4
Total	23
<u>Other required Courses for BA Chemistry major</u>	
Mathematics courses at the 300 level (STMATH 307, 308, 324 or 341)	5
Other upper division (300/400 level) chemistry courses, <u>including one additional lab.</u>	10
Total for degree	109
<u>Other UW requirements and electives (I+S, VLPA, Diversity and additional writing) or general electives</u>	71
<u>Total credits for degree</u>	180

Note: Incoming freshmen enroll in the Discovery Core sequence to satisfy university requirements on writing, composition, I+S, NW and VLPA. Transfer students would normally have all required lower division courses.

Example schedule for the BA in Chemistry with a Teaching & Learning Minor

Year	Autumn Quarter	Winter Quarter	Spring Quarter	Total Credits
1	Discovery Core – I (5) Calculus – I (5) General Chemistry – I (4) General Chem Lab – I (2) Total = 16	Discovery Core – II (5) Calculus – II (5) General Chemistry – II (4) General Chem Lab – II (2) Total = 16	Discovery Core – III (5) Calculus – III (5) General Chemistry – III (4) General Chem Lab – III (2) Total = 16	48
2	Physics – I (5) Organic Chemistry – I (4) 300-level Math (5) Total = 14	Physics – II (5) Organic Chemistry – II (4) Organic Chem Lab – I (3) B EDUC 230 – Culture, Knowledge, and Education (5) Total = 17	Physics – III (5) Organic Chemistry – III (4) Organic Chem Lab – II (3) General Elective (4) Total = 16	47
3	Physical Chemistry – I (4) Quant Envir Anal (5) General Elective (5) Total = 14	Physical Chemistry – II (4) Inorganic Chemistry – I (3) B EDUC 476 New Literacies in Digital Learning (5) B EDUC 330 Race, Culture and Identity in the Classroom (5) Total = 17	B EDUC 491(470) Disability Culture in School and Soc. (5) B EDUC 315 History of Educ in the U.S. (5) General Elective (5) Total = 15	46
4	Chemistry Elective (5) Individuals and Society (5) Undergraduate Mentoring in Chemistry (4) Total = 14	Chemistry Elective (5) Investigative Chem – I (3) B EDUC 456 Adolescents in the School and Society (5) I&S Total = 13	B EDUC 540 Principles of Inclusion: Students and Families (5) B EDUC 552 Curriculum, Instruction, and Assessment in Middle and Sec. Science I (5) General Elective (4) Total = 14	41
Total Credits				182

Additional coursework needed for a Washington State Teacher Certification with an endorsement in Chemistry

Year	Fall Quarter	Winter Quarter	Total Credits
5	B EDUC 591 Special Topics: September Experience (2) B EDUC 564 Field Experience in Secondary Schools (6) B EDUC 5XX Curriculum, Instruction, and Assessment in Middle and Secondary Chemistry (5) Total = 13	B EDUC 591 Special Topics: Professional Practice Seminar (2) B EDUC 565 Student Teaching (10) Total = 12	25

C. Upper Division Courses

All lower division courses and junior-level courses have been approved or are in the approval process now and will be offered during academic year 2014-2015. Senior-level courses will be developed, approved and offered in time for the 2015–2016 academic year. Additional upper division courses will be developed as quickly as possible and consistent with demand in the major. Possible courses are:

- Advanced Biochemistry Computational Lab
- Advanced Biochemistry Protein Expression
- Environmental Chemistry
- Advanced Environmental Chemistry Lab
- Greenhouse Gas Management
- Materials Chemistry I, II, III

VI. Admission to the Program

A. Admission for UWB Students

UWB students can be accepted into the program in their sophomore year. Transfer students can be accepted into the major upon acceptance to UWB. For acceptance into the major, students must have completed each of the prerequisite courses with a minimum grade of 2.0 in each course and a minimum cumulative GPA of 2.5 for all courses required for admission. At time of declaration of the Chemistry major, students should indicate which degree/option they are intending to pursue: BS in Chemistry, BS in Chemistry with Biochemistry option, or BA in Chemistry.

The admission requirements into the major are the same for all three degrees. Admissions are competitive and completion of the minimum requirements, described below, does not guarantee admission. The table shows the UWB prerequisite courses and their UW-Seattle and Cascadia Community College equivalencies.

Prerequisite courses for admission of UWB students into the Chemistry major (BS or BA) with UWS and Cascadia Community College equivalencies

UWB courses	UWS courses	Cascadia Community College
BCHEM 143, 153, 163, with labs BCHEM 144, 154, 164	Chem 142,152,162	Chem 161, 162, 163
BCUSP 124, 125, 126, or STMATH 124, 125, 126	Math 124, 125, 126	Math 151,152,163
Organic Chemistry I (BCHEM 237)	Chem 237	Chem 241

B. Admission for Transfer Students

Transfer students can be accepted directly into the major with the following minimum courses. Each course should have a minimum grade of 2.0 and a minimum cumulative GPA of 2.50 for all courses required for admission. At time of declaration of the Chemistry major, students should indicate which degree/option they are intending to pursue: BS in Chemistry, BS in Chemistry with Biochemistry option, or BA in Chemistry.

The admission requirements into the major are the same for all three degrees. Admissions are competitive and completion of the minimum requirements, described below, does not guarantee admission. The table shows the UWB prerequisites courses and their UW-Seattle and Cascadia Community College equivalencies.

Prerequisite courses for admission of transfer students into the Chemistry major (BS or BA) with UWS and Cascadia Community College equivalencies

UWB courses	UWS courses	Cascadia Community College
BCHEM 143, 153, 163, with labs BCHEM 144, 154, 164	Chem 142, 152, 162	Chem 161, 162, 163
BCUSP 124,125, 126, or STMATH 124, 125, 126	Math 124, 125, 126	Math 151, 152, 163
Organic Chemistry (BCHEM 237, 238, 239, 241, 242)	Chem 237, 238, 239, 241, 242	Chem 241, 242, 254, 255, 243

VII. Academic Support and Services

All UWB students have access to a variety of support services. These include the Academic Transition Program, Disabled Student Services and other support through the Office of Student

Services. We assume that these services will continue to be available to all UWB students and do not expect Chemistry students to put unusual demands on these services.

All UWB students have access to the UW Library system and this will provide critical resource for Chemistry majors. The UW Library guides for chemistry are given at these URLs: <http://libguides.uwb.edu/chemistry> and <http://guides.lib.washington.edu/chemistry>.

The chemistry holdings in the UW library are extensive and one of the largest in the Western United States. More than 500 chemistry-related journals are among the UW holdings, including all of the most important chemistry journals. A search on books with "chemistry" in the title revealed more than 85,000 available titles in the UW Library system, with more than 3,000 available online or at the UWB campus library.

Chemistry students will need library and librarian support to access, use and critically evaluate essential science resources and databases. They will also need librarians to answer reference and resource questions (via email, Instant Message and in person) and some librarian instruction (in person or through online instruction) on library basics, key electronic and print resources and specialized research skills. As the Chemistry degree program grows, it is likely that we will need additional librarian support.

VIII. Infrastructure: Laboratories and Instrumentation

UWB already offers a full complement of chemistry courses at the 100 and 200 level including general and organic chemistry. The BS/BA degrees in Chemistry will require additional resources to develop the upper division courses, many of which include laboratory experiences for students. The Physical Sciences Division, within the School of STEM at UWB, is committed to providing students with the best instructional experiences including hands-on practical use of state-of-the-art facilities and equipment. With the opening of UWB's 74,000-square-foot Discovery Hall in 2014, significant new chemistry laboratories will become available. These include two new teaching labs, two new instrument rooms and at least one new research laboratory. The labs will also be equipped with computer workstations that have platforms and diverse software for processing and integrating the data acquired during the performance of the experiments. These facilities are in addition to our existing laboratory facilities. These labs will be equipped with an array of modern chemistry instrumentation including UV-Vis, GC, GC-MS, HPLC, IC, AA, GFAA and ICP spectrometer. This equipment is either already available or planned in the current budget cycle. A budget for some key equipment has not yet been identified. This includes an NMR spectrometer (cost of approximately \$200K). To rectify this, several of the faculty recently submitted a proposal to the National Science Foundation for support of the NMR ("MRI: Acquisition of a 300 MHz NMR to support research and teaching at the University of Washington Bothell," P.I. D. Jaffe, CoIs L. Robbins and P. Anderson, submitted January 2014).

In the Fall of 2013, we added two additional tenure-track faculty members in biochemistry (P. Anderson and L. Robbins). These two new faculty will allow us to offer a strong emphasis in biochemistry as part of the Chemistry degree. We also recently hired a senior lecturer in organic chemistry (M. Thimmaiah), who will be able to support our increase in student population in organic chemistry courses. At present, we are searching for faculty to fill several positions to support our rapidly growing General Chemistry program and a Senior Lecturer in Physical Chemistry. At minimum, we will need to search for an analytical/environmental chemist in AY

2014–2015 to support upper division course work in analytical chemistry. As the degree grows, we will also need to make new tenure-track hires in physical, inorganic and organic chemistry.

The chemistry program has been fortunate to have two dedicated and experienced support personnel for administrative tasks and technical functions. Coordination of all laboratory activities including lab section scheduling, purchase and acquisition of lab chemicals and equipment, along with the setup and running of the labs, are being ably managed and handled by the chemistry coordinator and a laboratory technician. With the startup of the chemistry degree and new upper division laboratory courses, it is likely that additional lab support will be required. Administrative assistance is performed by a program coordinator who handles the scheduling, enrollment, and other duties and tasks in support of the various functions of the program. Financial assistance and training for upper division and experienced students to gain skills as graders is also currently being provided. With the rapidly growing student populations in the chemistry courses, steps are also being taken to develop courses that will allow upper division students to function as undergraduate teaching assistants/mentors, thereby enabling them to gain instructional experience. Also, we will need additional support in the QSC in the number and training of tutors to support the growth of a chemistry degree.

In summary, we expect a significant number of students will opt into the Chemistry BS and BA degrees immediately upon startup in AY 2014–2015. This will require additional laboratory support technicians, administrative staff support and advisors..

IX. Administration

The Chemistry majors (BS and BA) will be housed in the Physical Sciences (PS) Division (PSD), within the UWB School of Science, Technology, Engineering and Mathematics (STEM). The PS Division currently has 10 voting faculty members, headed by a Chair, currently Professor Dan Jaffe. The School of STEM is headed by Dean Elaine Scott. All curricular matters are handled at the division level.

X. Assessment

The University of Washington mandates reviews of all academic units, including undergraduate degree programs, at least every 10 years; these reviews are conducted jointly by the Dean of the Graduate School and the Dean of Undergraduate Academic Affairs (<http://www.grad.washington.edu/fac-staff/programreviews/existing.shtml>).

Our overall assessment strategy will focus on:

- Use of multiple measures of assessment
- Use of data collected for continuous improvement of the degree program
- The overall program, as opposed to individual faculty or students

Data to be collected to measure the effectiveness of the degree program in meeting its learning objectives will include:

- **Student evaluation of each course.** Student evaluation forms will provide students the opportunity to directly address course learning outcomes (were they successful?) and

program learning objectives addressed in the course. Course evaluations also allow students to comment on the relevance of course content and the role of the course within the degree program.

- **Peer monitoring of instruction.** Through classroom visits, faculty members will be able to become familiar with both what other courses cover and the teaching styles used by other instructors.
- **Course-embedded assessment.** Student performance will be assessed on exams, lab exercises, papers and presentations, and in the course overall.
- **Student focus groups and exit interviews.**
- **Success of student-faculty research.** We will look at the number of presentations at conferences, number of student co-authored abstracts and publications, and so on.
- **Monitoring of student retention within the program.** Student retention will be used to evaluate student preparation, admission requirements, and the effectiveness of student support services.
- **Use of standardized ACS exams in Chemistry.** The ACS provides a nationally normed exam that includes percentile scores for each student and for the program as a whole. The exam will be administered as close to the end of a student's degree program as possible. Using these exams will allow us to identify any weaknesses in the program and will provide a means, however imperfect, of comparing the content knowledge of our students with their peers nationwide.
- **Tracking of Program Alumni.** We will look at the number of students admitted to medical or other professional schools and the number of students admitted to PhD programs. In addition, surveys will be sent to alumni 3–5 years after graduation to identify the number of alumni employed (or pursuing further education) in chemistry and how well they perceive the program to have prepared them for work in chemistry.

We will also seek outside program evaluation and approval by the ACS.

XI. Chemistry Faculty in the Physical Sciences Division

Dr. Peter C. Anderson, Assistant Professor, Biochemistry

Dr. Khushroo P. Daruwala, Senior Lecturer, Organic Chemistry

Dr. Brandon Finley, Lecturer, General Chemistry

Dr. Kim Gunnerson, Lecturer, General Chemistry

Dr. Daniel A. Jaffe, Professor and Chair of the Physical Sciences Division, Environmental and Atmospheric Chemistry

Dr. Lori Robbins, Assistant Professor, Biochemistry

Dr. Muralidhara Thimmaiah, Senior Lecturer, Organic Chemistry

XII. Program Budget

New Funding for Chemistry Major (BS, BS with Biochemistry, and BA), Start Fall 2014 with 20 students

	YEAR 1, 2014-15		YEAR 2, 2015-16		YEAR 3, 2016-17		THREE- YEAR TOTAL	NOTES
	FTE	COST	FTE	COST	FTE	COST		
Senior Lecturer @ 100% fte	1	75,000					75,000	One new Sr. Lect. in AY 2014-15 already approved
Benefit load @ 22.3%		16,725		-		-	16,725	
Assistant Professor @ 100% fte			1	82,000	1	85,280	167,280	One new Assistant Prof. in AY 2015-16
Benefit load @ 22.3%		-		18,286		19,017	37,303	
Assistant Professor @ 100% fte					1	85,000	85,000	One new Assistant Prof. in AY 2016-17
Benefit load @ 22.3%		-		-		18,955	18,955	
Lab Tech @ 100% fte	1	50,000	1	52,000	1	54,080	156,080	
Benefit load @ 38.0%				19,760		20,550	40,310	
Program Advisor @ 25% fte		-	0.25	15,000	0.25	15,000	30,000	
Benefit load @ 26.2%		-		3,930		3,930	7,860	
Program Coordinator @ 25% fte		-	0.25	12,600	0.25	12,600	25,200	
Benefit load @ 38.0%		-		4,788			4,788	
IT support @ 5.0% fte	0.05	2,100	0.05	2,184	0.05	2,271	6,555	
Benefit load @ 38.0%		798		830		863	2,491	
Library staff salaries and operations (0.10 FTE in Year 1 rising to 0.35 FTE	0.1	7,690	0.1	7,920	0.35	27,120	42,730	Based on ME proposal

at steady-state in Year 3) plus Student hourly							
Library total collections (Books/Media and E-resources)		13,480	14,220		15,000	42,700	Based on ME proposal
Academic support—Quantitative skills and writing tutors (3.3 FTE)		16380	16,870		17,380	50,630	Based on ME proposal
Faculty search costs		5,000	5,000		5,000	15,000	
Faculty moving & startup costs		15,000	150,000		150,000	315,000	Startup will vary depending on research
TOTAL COSTS:		202,173	405,388		532,047	1,139,608	

UW Bothell
Routing
1503Form

Document Name: Full Proposal Chemistry, BS

- I. Program
- II. GFO EC
- III. AC
- IV. GFO EC - TriCampus

I. PROGRAM/SCHOOL		
Elaine Scott	Date	
Dean	Recommend	
	Recommend with Changes (attach changes)	
Signature	Do not recommend (attach explanation)	
II. GFO EC		
Jerelyn Resnick	Date	
Chair	Recommend	
<i>Jerelyn Resnick 3-13-14</i>	Recommend with Changes (attach changes)	
Signature	Do not recommend (attach explanation)	
III. ACADEMIC AFFAIRS		
Susan Jeffords	Date	
Vice Chancellor	Recommend	
	Recommend with Changes (attach changes)	
Signature	Do not recommend (attach explanation)	
IV. GFO EC: TriCampus		
Jerelyn Resnick		
Signature	Date	
Transmitted to: _____ Date _____		

Undergraduate Curriculum Review Process for New Programs[Home](#) [Manage](#) [Participants](#) [Profile \(tap2\)](#)

Bothell: 1) Bachelor of Arts degree in Chemistry, 2) Bachelor of Science degree in Chemistry, and 3) Bachelor of Science degree in Chemistry with an option in Biochemistry (BCHEM-20140123)

UWCR

Posted Apr 2, 2014 2:23 PM

UWCR



Edited Apr 3, 2014 6:46 AM by uwcr (Board owner)

Board owner

Please review the attached 1503 pdf requesting to establish 1) Bachelor of Arts degree in Chemistry, 2) Bachelor of Science degree in Chemistry, and 3) Bachelor of Science degree in Chemistry with an option in Biochemistry at the Bothell campus and post comments by 5:00 pm on Friday, April 25.

If you have any problems viewing the attachment or need disability accommodations, please contact the University Curriculum Office at uwcr@uw.edu.

Attachments:

 BCHEM-20140123.pdf 3.8M Download View

Undergraduate Curriculum Review Process for New... > Bothell: 1) Bachelor of Arts degree in Chemistr...

[Contact us](#)[catalysthelp@uw.edu](#)

UNIVERSITY CAMPUSES UNDERGRADUATE PROGRAM REVIEW PROCEDURES**

CHECKLIST

Title of Proposal: Bachelor of Arts degree in Chemistry, Bachelor of Science degree in Chemistry, option in Biochemistry within the Bachelor of Science degree in Chemistry (BCHEM-20140123)

Proposed by (unit name): STEM

Originating Campus:

☐ UW, Seattle

☒ UW, Bothell

☐ UW, Tacoma

I. Phase I. Developed Proposal Review (to be completed by Originating Campus' Academic Program Review body)

A. Review Completed by: (list name of program review body)

Chaired by:

03/13/14 Date proposal received by originating campus's review body

04/01/14 Date proposal sent to University Registrar

04/02/14 Date proposal posted & email sent to standard notification list

04/30/14 Date of originating campus's curriculum body approval

(Note: this date must be 15 business days or more following date of posting)

B. 0 Number of comments received. Attach the comments and a summary of the consideration and responses thereof : (1-2 paragraphs)

II. Phase II. Final Proposal Review (to be completed by FCTCP)

A. Review Completed by:

☒ FCTCP subcommittee

☐ FCTCP full council

Chaired by: William Erdly

5/3/14 Date request for review received from University Registrar
5/8/14 Date of FCTCP report

B. Review (attached)

YES NO

- ☒ Was notice of proposal posted on UW Website for 15 business days?
☒ Was notice of proposal sent to standard mailing list 15 business days in advance of academic program review?
☒ Were comments received by academic program review body?
☒ Was response to comments appropriate? (explain, if necessary)
☒ Was final proposal reviewed by FCTCP within 14 days of receipt?
☒ Was there adherence to the University Campuses Undergraduate Program Review Process? (explain, if necessary)

C. Recommendation

- ☒ Forward for final approval
☐ Forward to Provost because of University issues (Explain)
☐ Return to campus council because of insufficient review (Explain).

**Endorsed by Faculty Senate Executive Committee, 1/10/05, modified 1/31/06; These procedures apply to new undergraduate degrees, majors, minors (and certificates) and substantive changes to same