



## SOUTH DAKOTA BOARD OF REGENTS ACADEMIC AFFAIRS FORMS

### Intent to Plan for a New Program

Use this form to request authorization to plan a new baccalaureate major, associate degree program, or graduate program; formal approval or waiver of an Intent to Plan is required before a university may submit a related request for a new program. The Board of Regents, Executive Director, and/or their designees may request additional information. After the university President approves the Intent to Plan, submit a signed copy to the Executive Director through the system Chief Academic Officer. Only post the Intent to Plan to the university website for review by other universities after approval by the Executive Director and Chief Academic Officer.


<b>UNIVERSITY:</b>	Northern State University (NSU)
<b>DEGREE(S) AND TITLE OF PROGRAM:</b>	B.S. in Biochemistry
<b>INTENDED DATE OF IMPLEMENTATION:</b>	Fall 2020

**Please check this box to confirm that:**

- The individual preparing this request has read [AAC Guideline 2.4](#), which pertains to new intent to plan requests for new programs, and that this request meets the requirements outlined in the guidelines.
- This request will not be posted to the university website for review of the Academic Affairs Committee until it is approved by the Executive Director and Chief Academic Officer.

#### University Approval

*To the Board of Regents and the Executive Director: I certify that I have read this intent to plan, that I believe it to be accurate, and that it has been evaluated and approved as provided by university policy.*

  
\_\_\_\_\_  
President of the University

2/5/2020  
\_\_\_\_\_  
Date

Note: In the responses below, references to external sources, including data sources, should be documented with a footnote (including web addresses where applicable).

**1. What is the general nature/purpose of the proposed program? Please include a brief (1-2 sentence) description of the academic field in this program.**

The NSU Department of Science and Mathematics is proposing a Bachelor of Science in Biochemistry degree program that builds on existing courses and faculty expertise within the department. The purpose of the proposed B.S. in Biochemistry program is to provide students with the relevant and practical knowledge and skills related to areas of chemistry and biochemistry (general, analytical, physical, and organic). Students in this program will acquire the critical, analytical, and quantitative skills necessary to analyze, comprehend, and synthesize solutions to complex scientific problems. The B.S. in Biochemistry program will prepare students for a graduate or professional degree program (medical, dental, veterinary, pharmaceutical, and other clinical or health professions) or a career in biotechnology, biochemical research, biomedical research, or chemistry research.

The academic field of Biochemistry merges the chemical, biological and physical sciences to explain biological processes on a molecular-level. It is a field that can be applied in numerous areas including the health professions, pharmaceuticals, plant and animal agriculture, the environment, energy fields, and food industries and professions. Knowledge learned in this critical field allows students to function and succeed in these well-established and continuously evolving fields.

2. **What is the need for the proposed program (e.g., Regental system need, institutional need, workforce need, etc.)? What is the expected demand for graduates nationally and in South Dakota (provide data and examples; data sources may include but are not limited to the South Dakota Department of Labor, the US Bureau of Labor Statistics, Regental system dashboards, etc.)? Please cite any sources in a footnote.**

NSU’s current B.S. in Chemistry and B.S. in Biology programs are traditional degrees that do not include a sufficient level of the biochemical coursework required for students intending to enter a graduate or professional degree program (medical, dental, veterinary, pharmaceutical, and other clinical or health professions) or a career in biochemical research or biomedical research. Providing this program for our students is vital if we want to give them the opportunity to be more competitive in diverse twenty-first century scientific and medical spheres, whether in South Dakota, the region, or the nation.

The U.S. Bureau of Labor Statistics provides the following occupational growth expectancy for jobs in which a biochemistry degree would be suitable:

<b>Occupation</b>	<b>Expected Growth 2018-2028</b>	<b>Growth Rate Compared to All Occupations (as fast as, faster, or much faster)</b>	<b>Source Link</b>
Genetic Counselor	27% increase	much faster than average	<a href="https://www.bls.gov/ooh/healthcare/genetic-counselors.htm">https://www.bls.gov/ooh/healthcare/genetic-counselors.htm</a>
Physician Assistant	31% increase	much faster than average	<a href="https://www.bls.gov/ooh/healthcare/physician-assistants.htm">https://www.bls.gov/ooh/healthcare/physician-assistants.htm</a>
Physical Therapist	22% increase	much faster than average	<a href="https://www.bls.gov/ooh/healthcare/physical-therapists.htm">https://www.bls.gov/ooh/healthcare/physical-therapists.htm</a>
Dentist	7% increase	faster than average	<a href="https://www.bls.gov/ooh/healthcare/dentists.htm">https://www.bls.gov/ooh/healthcare/dentists.htm</a>
Physician and Surgeon	7% increase	faster than average	<a href="https://www.bls.gov/ooh/healthcare/physicians-and-surgeons.htm">https://www.bls.gov/ooh/healthcare/physicians-and-surgeons.htm</a>
Veterinarian	18% increase	much faster than average	<a href="https://www.bls.gov/ooh/healthcare/veterinarians.htm">https://www.bls.gov/ooh/healthcare/veterinarians.htm</a>
Biomedical Engineer	4% increase	as fast as average	<a href="https://www.bls.gov/ooh/architecture-and-engineering/biomedical-engineers.htm">https://www.bls.gov/ooh/architecture-and-engineering/biomedical-engineers.htm</a>
Biochemist	6% Increase	as fast as average	<a href="https://www.bls.gov/ooh/life-physical-and-social-science/biochemists-and-biophysicists.htm">https://www.bls.gov/ooh/life-physical-and-social-science/biochemists-and-biophysicists.htm</a>

Chemical Engineer	6% increase	as fast as average	<a href="https://www.bls.gov/ooh/architecture-and-engineering/chemical-engineers.htm">https://www.bls.gov/ooh/architecture-and-engineering/chemical-engineers.htm</a>
Nurse Practitioner	26% increase	much faster than average	<a href="https://www.bls.gov/ooh/healthcare/nurse-anesthetists-nurse-midwives-and-nurse-practitioners.htm">https://www.bls.gov/ooh/healthcare/nurse-anesthetists-nurse-midwives-and-nurse-practitioners.htm</a>
Analytical Chemist	4% increase	as fast as average	<a href="https://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materials-scientists.htm">https://www.bls.gov/ooh/life-physical-and-social-science/chemists-and-materials-scientists.htm</a>
Clinical Researcher	8% increase	faster than average	<a href="https://www.bls.gov/ooh/life-physical-and-social-science/medical-scientists.htm">https://www.bls.gov/ooh/life-physical-and-social-science/medical-scientists.htm</a>
Forensic Science Technician	14% increase	much faster than average	<a href="https://www.bls.gov/ooh/life-physical-and-social-science/forensic-science-technicians.htm">https://www.bls.gov/ooh/life-physical-and-social-science/forensic-science-technicians.htm</a>

Additionally, according to the *US News and World Report*, biochemist is listed as number 3 in the 2019 top 100 Best Science Jobs, number 27 in the top 100 Best STEM Jobs, and number 74 in the top 100 Best Jobs overall.<sup>1</sup> In that same report, biomedical engineer is listed as number 6 in the 2019 top 100 Best Engineering Jobs, number 30 in the top 100 Best STEM Jobs, and number 93 in the top 100 Best Jobs overall.<sup>2</sup>

### 3. How would the proposed program benefit students?

The Department of Science and Mathematics is committed to fulfilling the University's mission by advancing student success and preparing them to meet the scientific challenges of the present and future. The department's proposed B.S. in Biochemistry program is a comprehensive, practical, multi-disciplinary program that will prepare students for graduate study, professional study, and careers in diverse scientific and health profession areas that require a solid background in biochemistry.

Graduates of the proposed program will be prepared for application to advanced degree programs such as medical, dental, or pharmacy schools or graduate programs in biochemistry, chemistry, or biology. Additionally, graduates will be prepared for immediate employment in medical, industrial, and government positions as scientists, lab technicians, research assistants, and chemists.

### 4. How does the proposed program relate to the university's mission as provided in South Dakota Statute and Board of Regents Policy, and to the current Board of Regents Strategic Plan 2014-2020?

The proposed B.S. in Biochemistry program supports Northern State University's mission to: create, provide and facilitate diverse academic, civic, social and cultural opportunities that prepare students for their future endeavors, while also enriching the local and regional community.<sup>3</sup>

<sup>1</sup> U.S. News and World Report. <https://money.usnews.com/careers/best-jobs/biochemist> (accessed Sept 25, 2019).

<sup>2</sup> U.S. News and World Report. <https://money.usnews.com/careers/best-jobs/biomedical-engineer> (accessed Sept 25, 2019).

<sup>3</sup> Northern State University Mission, Vision, and Values. <https://www.northern.edu/about/office-president/mission> (accessed Sept 25, 2019).

The proposed degree program also supports the Northern State University mission as provided in Board of Regents Policy 1, which states:

The legislature established Northern State University to meet the needs of the State, the region, and nation by providing undergraduate and graduate programs in education and other courses or programs as the Board of Regents may determine. . . . The Board implemented SDCL 13-59-1 by authorizing graduate and undergraduate programs in education to promote excellence in teaching and learning, to support research, scholarly and creative activities, and to provide service to the State of South Dakota, the region, and the nation.

The proposed program would promote “excellence in teaching and learning”. Additionally, the proposed curriculum of this program would “support research, creative, and scholarly activities”. The B.S. in Biochemistry will “provide service to the State of South Dakota, the region, and the nation”. As is stated in item two above, providing this program for our students is vital if we want to give them the opportunity to be more competitive in diverse twenty-first century scientific and medical spheres, whether in South Dakota, the region, or the nation.

This proposal supports the Board of Regents Strategic Plan 2014-2020 by growing the number of approved undergraduate programs, documenting that academic programs are of high quality.

**5. Do any related programs exist at other public universities in South Dakota? If a related program already exists, explain the key differences between the existing programs and the proposed program, as well as the perceived need for adding the proposed new program. Would approval of the proposed new program create opportunities to collaborate with other South Dakota public universities?**

SDSU currently offers a B.S. degree in Biochemistry. The key difference between NSU’s proposed program and SDSU’s program is that NSU’s focus is on students intending to enter a healthcare profession or graduate and professional study in medicine or other healthcare fields. Because all courses will be offered face-to-face on Northern State University’s campus, approval of the proposed new program would not have a negative impact on SDSU’s program.

Our program would create opportunities to collaborate with other South Dakota public universities, particularly through collaborative undergraduate research, which is an intended focus of NSU’s Department of Science and Mathematics. Students could also attend on-campus seminars and participate in undergraduate conferences.

**6. Do related programs exist at public colleges and universities in Minnesota, North Dakota, Montana, and/or Wyoming?**

	<b>Institution</b>	<b>Program Title</b>
<i>Minnesota</i>	University of Minnesota-Twin Cities	B.S. Biochemistry
	University of Minnesota-Duluth	B.S. Biochemistry / B.A. Biochemistry
	Winona State University	B.S. Biochemistry and Molecular Biology

<i>North Dakota</i>	North Dakota State University	B.S. Biochemistry and Molecular Biology
<i>Montana</i>	University of Montana	B.S. Biochemistry
<i>Wyoming</i>	NONE	

**7. Are students enrolling in this program expected to be new to the university or redirected from other existing programs at the university?**

We do expect some students to be redirected from the existing programs Biology and Chemistry within our department, as this degree would suit individual students better than a general degree in these areas. However, we also anticipate some students will elect to take this program as a double major. We also believe that the strength of our current science programs, our science faculty, our established curricular rigor, and our state of the art facility will be a recruiting strength for the B.S. in Biochemistry.

**8. What are the university's expectations/estimates for enrollment in the program through the first five years? What are the university's expectations/estimates for the annual number of graduates from the program after the first five years? Provide an explanation of the methodology the university used in developing these estimates.**

Expected enrollment and graduation:

First Year Enrollment 10-12

Fourth Year Enrollment 12-15

Graduation (Fourth Year and thereafter) 15-20

*Further Explanation:*

To calculate the first-year enrollment, we took a percentage of our current Biology and Chemistry majors and anticipated that a minimum of 10% will enroll this program as either a new major or a concurrent double major, which is in keeping with the amount of Biology and Chemistry majors combined that we graduate each year. To calculate the fourth year enrollment, we anticipated that the program would serve as a recruiting tool for students to select NSUs Biochemistry major, especially those students entering as pre-med, which would then allow for an increase in students entering the program by its fourth year, calculated at a minimum of 10% enrolling in the program.

**9. Complete the following charts to indicate if the university intends to seek authorization to deliver the entire program on campus, at any off campus location (e.g., UC Sioux Falls, Capital University Center, Black Hills State University-Rapid City, etc.) or deliver the entire program through distance technology (e.g., as an on-line program)?**

	<b>Yes/No</b>	<b>Intended Start Date</b>
<b>On campus</b> - while the entire program will be offered on campus with courses in fall, spring, and summer, some courses may be fulfilled through already established online offerings.	Yes	<b>Fall 2020</b>

	Yes/No	If Yes, list location(s)	Intended Start Date
Off campus	No		

	Yes/No	If Yes, identify delivery methods <i>Delivery methods are defined in AAC Guideline 5.5.</i>	Intended Start Date
Distance Delivery (online/other distance delivery methods)	No		
Does another BOR institution already have authorization to offer the program online?	No	If yes, identify institutions:	

**10. What are the university's plans for obtaining the resources needed to implement the program?**

	Development/ Start-up	Long-term Operation
Reallocate existing resources <i>- this reallocation would consist of utilizing the Biology and Chemistry faculty currently in place who would teach these courses.</i>	Yes	Yes
Apply for external resources	No	No
Ask Board to seek new State resources	No	No
Ask Board to approve a new or increased student fee	No	No

**11. Curriculum Example: Provide (as Appendix A) the curriculum of a similar program at another college or university. Identify the college or university and explain why the selected program is a model for the program under development.**

Included as Appendix A are curriculum from B.S. in Biochemistry programs at two universities. The curriculum from the University of Kansas is included because its inclusion of advanced level biology electives allows students to choose specific topics to focus on beyond that which is required in the course. We include this aspect in our proposed program curriculum, but we added advanced level chemistry electives as well. Additionally, they included multiple quantitative course requirements, which we have also incorporated into our proposed curriculum. Similarly, the curriculum of the B.S. in Biochemistry program at Roger Williams University is included because of their quantitative courses, but they are primarily included because their program seems entirely manageable and ours could easily conform to a similar framework. NSU currently offers the majority of classes included in both of the sample curriculums provided, making these suitable choices for sample curriculum.

Included as Appendix B is a sample curriculum for the proposed B.S. in Biochemistry program at Northern State University.

## **APPENDIX A: Curriculum of Similar Program**

### **University of Kansas**

<https://catalog.ku.edu/liberal-arts-sciences/biology/bs-biochemistry/#requirementstext>

In addition to degree and major requirements for all plans and subplans, all students must complete the KU General Education Requirement.

<b>Code</b>	<b>Title</b>	<b>Hours</b>
<b>General Science Requirements</b>		
Majors must complete the following general science requirements that serve as foundational courses for this major.		
Biology Orientation Seminar. Satisfied by:		
<a href="#">BIOL 105</a>	Biology Orientation Seminar	1
Chemistry I. Satisfied by one of the following:		
<a href="#">CHEM 170</a>	Chemistry for the Chemical Sciences I	
<a href="#">CHEM 130</a>	General Chemistry I	5
<a href="#">CHEM 190</a> & <a href="#">CHEM 191</a>	Foundations of Chemistry I, Honors and Foundations of Chemistry I Laboratory, Honors	
Chemistry II. Satisfied by one of the following:		
<a href="#">CHEM 175</a>	Chemistry for the Chemical Sciences II	5
<a href="#">CHEM 135</a>	General Chemistry II	
<a href="#">CHEM 195</a> & <a href="#">CHEM 196</a>	Foundations of Chemistry II, Honors and Foundations of Chemistry II Laboratory, Honors	
Organic Chemistry I. Satisfied by one of the following:		
<a href="#">CHEM 330</a>	Organic Chemistry I	3
<a href="#">CHEM 380</a>	Organic Chemistry I, Honors	
Organic Chemistry I Laboratory. Satisfied by:		
<a href="#">CHEM 331</a>	Organic Chemistry I Laboratory	2
Organic Chemistry II. Satisfied by one of the following:		
<a href="#">CHEM 335</a>	Organic Chemistry II	3
<a href="#">CHEM 385</a>	Organic Chemistry II, Honors	
Organic Chemistry II Laboratory. Satisfied by:		
<a href="#">CHEM 336</a>	Organic Chemistry II Laboratory	2
Calculus I & II. Satisfied by:		
<a href="#">MATH 125</a> & <a href="#">MATH 126</a>	Calculus I and Calculus II	8

Code	Title	Hours
Physics. Satisfied by one of the following options:		8-9
Option 1: General Physics I & II		
PHSX 211 & PHSX 216	General Physics I and General Physics I Laboratory	
PHSX 212 & PHSX 236	General Physics II and General Physics II Laboratory	
Option 2: College Physics I & II		
PHSX 114 & PHSX 115	College Physics I and College Physics II	
<b>Biochemistry Course Requirements</b>		
Satisfied by completing 35 hours from courses below.		
Principles of Molecular and Cellular Biology. Satisfied by one of the following:		4
BIOL 150	Principles of Molecular and Cellular Biology	
BIOL 151	Principles of Molecular and Cellular Biology, Honors	
Principles of Organismal Biology. Satisfied by one of the following:		4
BIOL 152	Principles of Organismal Biology	
BIOL 153	Principles of Organismal Biology, Honors	
Principles of Genetics. Satisfied by one of the following:		4
BIOL 350	Principles of Genetics	
BIOL 360	Principles of Genetics, Honors	
Cell Structure and Function. Satisfied by:		3
BIOL 416	Cell Structure and Function	
Biochemistry I. Satisfied by:		4
BIOL 636	Biochemistry I	
Introductory Biochemistry Laboratory. Satisfied by:		2
BIOL 637	Introductory Biochemistry Laboratory	
Biochemistry II. Satisfied by:		3
BIOL 638	Biochemistry II	
Advanced Biochemistry Laboratory. Satisfied by:		2
BIOL 639	Advanced Biochemistry Laboratory	
Senior Seminar in Biochemistry. Satisfied by:		1
BIOL 599	Senior Seminar: _____ (Must be taken in senior year)	
Analytical Chemistry. Satisfied by:		3



Code	Title	Hours
CHEM 400	Analytical Chemistry	
	Analytical Chemistry Laboratory. Satisfied by:	2
CHEM 401	Analytical Chemistry Laboratory	
	Physical Chemistry. Satisfied by one of the following:	3
CHEM 510	Biological Physical Chemistry	
CHEM 530	Physical Chemistry I	
<b>Biochemistry Required Electives</b>		
	Satisfied by completing 12 hours of BIOL courses numbered 400 or higher, which must be selected in consultation with a Biochemistry advisor. No more than 3 hours of <a href="#">BIOL 423</a> Non-Lab Independent Study and/or <a href="#">BIOL 424</a> Independent Study (combined) can be applied towards the elective requirement.	12
Course List		

## Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

### Major Hours

Satisfied by 47 hours of major courses.

### Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

### Major Junior/Senior Hours

Satisfied by a minimum of 12 hours from junior/senior courses (300+) in the major.

### Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the [Semester/Cumulative GPA Calculator](#).

## **APPENDIX A: Curriculum of Similar Program**

### **Roger Williams University**

[http://catalog.rwu.edu/preview\\_program.php?catoid=4&poid=820&returnto=182&\\_ga=2.108209602.136133527.1569777598-284053775.1569777598](http://catalog.rwu.edu/preview_program.php?catoid=4&poid=820&returnto=182&_ga=2.108209602.136133527.1569777598-284053775.1569777598)

#### **Program Requirements**

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Majors must satisfy University Core Curriculum requirements and the College speech requirement, COMM 210. Biochemistry majors must complete the following courses and sufficient electives to total at least 120 credits. Majors are encouraged to take Microbiology, Biotechnology, Bioethics and 3 credits of Internship/Research in order to obtain the biotechnology certification along with the B.S. in Biochemistry.

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#### **Required Courses**

CHEM 191 - Principles of Chemistry I and Lab  
and  
CHEM 192 - Principles of Chemistry II and Lab

CHEM 301 - Organic Chemistry I and Lab  
and  
CHEM 302 - Organic Chemistry II and Lab

CHEM 311 - Analytical Chemistry and Lab  
CHEM 312 - Instrumental Methods of Analysis and Lab  
CHEM 320 - Inorganic Chemistry and Lab

CHEM 390 - Biochemistry and Lab  
or  
BIO 390 - Biochemistry and Lab

CHEM 391 - Chemical Thermodynamics and Lab  
CHEM 435 - Advanced Biochemistry  
CHEM 423L - Advanced Biochemistry Lab  
BIO 450 - Research in the Biological Sciences

MATH 213 - Calculus I and Lab  
and  
MATH 214 - Calculus II and Lab

PHYS 201 - Physics I with Calculus and Lab  
and  
PHYS 202 - Physics II with Calculus and Lab

BIO 103 - Biology I and Lab  
BIO 200 - Genetics  
BIO 325 - Molecular Cell Biology and Lab  
BIO 331 - Bioinformatics and Lab

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**Plus an Additional 8 Credits from the Following Courses**

At least one must be a Chemistry course.

BIO 315 - Animal Physiology and Lab  
BIO 323 - Developmental Biology and Lab  
BIO 330 - Neurobiology  
BIO 331 - Bioinformatics and Lab  
BIO 340 - Biotechnology and Lab  
BIO 370 - Virology and Lab  
BIO 380 - Parasitology and Lab  
BIO 392 - Animal Nutrition  
CHEM 392 - Quantum Chemistry and Lab  
CHEM 421 - Advanced Chemistry Lab I  
CHEM 431 - Advanced Inorganic Chemistry  
CHEM 432 - Advanced Organic Chemistry  
CHEM 433 - Advanced Physical Chemistry  
CHEM 434 - Advanced Environmental Chemistry

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*\* Biology or Chemistry may not serve as a second major or minor for a Biochemistry major and Biochemistry may not serve as a second major or minor for a Biology or Chemistry major.*

## Appendix B: Draft NSU Curriculum

### Northern State University BS Biochemistry Draft Curriculum

Provided here are sample courses that we would offer in the program. If we were accepted to enter the planning process for this program, we would use already established courses at NSU and consider including already established courses listed on the BOR Course Inventory Report that are not currently offered at NSU (indicated with a †). Students in this program are expected to take the following five courses/labs as part of their General Education requirements:

BIOL/CHEM 130 Success in Science	(1)
IDL 190 Freshman Seminar	(2)
BIOL 151/151L General Biology I and lab	(4)
BIOL 153/153L General Biology II and lab	(4)
CHEM 112/112L General Chemistry I and lab	(4)
CHEM 114/114L General Chemistry II and lab	(4)

SUBJECT CATEGORY	CREDITS
<b>A. Required Courses</b>	<b>35</b>
BIOL 281/MATH 281 Introduction to Statistics I	(3)
CHEM 326/326L Organic Chemistry I and lab	(4)
CHEM 328/328L Organic Chemistry II and lab	(4)
CHEM 332/332L Analytical Chemistry and lab	(4)
CHEM 460/460L Biochemistry I and lab	(4)
CHEM 465/465L Biochemistry II and lab <sup>†</sup>	(4)
CHEM 498 Undergraduate Research/Scholarship (Research experience in Biochemistry)	(3)
MATH 123 Calculus I	(3)
PHYS 211/211L Physics I and lab	(3)
PHYS 213/213L Physics II and lab	(3)
<b>B. Quantitative Electives (choose 1)</b>	<b>3-4</b>
<ul style="list-style-type: none"><li>• BIOL 250/250L Introduction to Bioinformatics and Proteomics and lab (3 cr)</li><li>• BIOL 282 Introduction to Statistics II (3 cr)</li><li>• MATH 125 Calculus II (4 cr)</li></ul>	
<b>C. Advanced Biology Electives (choose 3)</b>	<b>12</b>
<ul style="list-style-type: none"><li>• BIOL 325/325L Physiology and lab (4 cr)</li><li>• BIOL 331/331L Microbiology and lab (4 cr)</li><li>• BIOL 343/343L Cell and Molecular Biology and lab (4 cr)</li><li>• BIOL 371/371L Genetics and lab (4 cr)</li><li>• BIOL 422/422L Immunology and lab (4 cr)</li><li>• BIOL 483/483L Developmental Biology and lab (4 cr)</li></ul>	
<b>D. Advanced Chemistry Electives (choose 2)</b>	<b>6-8</b>
<ul style="list-style-type: none"><li>• CHEM 342 Physical Chemistry I (3 cr)</li><li>• CHEM 344 Physical Chemistry II (3 cr)</li><li>• CHEM 434/434L Instrumental Chemistry (4 cr)</li><li>• CHEM 452/452L Inorganic Chemistry and lab (4 cr)</li><li>• CHEM 482 Environmental Chemistry (3 cr)</li></ul>	
<b>TOTAL PROGRAM CREDITS OUTSIDE OF GENERAL EDUCATION REQUIREMENTS, INCLUDING FYS</b>	<b>56-59</b>

