

**SOUTH DAKOTA BOARD OF REGENTS**

**Academic and Student Affairs**  
**Consent**

**AGENDA ITEM: 7 – B (1)**

**DATE: June 27-29, 2017**

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**SUBJECT: New Specialization: USD Bioinformatics Specialization in the Biological Sciences, Ph.D. Program**

The University of South Dakota (USD) requests authorization to offer a Bioinformatics specialization within the Doctor of Philosophy (Ph.D.) in Biological Sciences program. Specializations within a degree program appear on a transcript and require Board approval.

The proposed specialization concentrates on analyzing large data sets originating from a variety of sources. Courses in the subject area will focus upon Biology, as well as Mathematics, Statistics, and Computer Science. The primary focus of this Bioinformatics specialization is to provide Ph.D. students in Biological Sciences an opportunity to collaborate on high-level research projects. The specialization consists of 16 credit hours and requires creation of four new courses.

USD is requesting authorization for on campus delivery of the specialization.

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**DRAFT MOTION 20170627\_7-B(1):** I move to approve USD's Bioinformatics Specialization in the Biological Sciences, Ph.D., program as described in Attachment I.



**SOUTH DAKOTA BOARD OF REGENTS**  
**ACADEMIC AFFAIRS FORMS**  
**New Specialization**

<b>UNIVERSITY:</b>	<b>USD</b>
<b>TITLE OF PROPOSED SPECIALIZATION:</b>	<b>Bioinformatics</b>
<b>NAME OF DEGREE PROGRAM IN WHICH SPECIALIZATION IS OFFERED:</b>	<b>Biological Sciences, Ph.D.</b>
<b>INTENDED DATE OF IMPLEMENTATION:</b>	<b>8/22/2017</b>
<b>PROPOSED CIP CODE:</b>	<b>26.0101</b>
<b>UNIVERSITY DEPARTMENT:</b>	<b>Biology</b>
<b>UNIVERSITY DIVISION:</b>	<b>Arts &amp; Sciences</b>

### University Approval

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

*Elizabeth M. Freeburg*

*3/20/17*

\_\_\_\_\_  
 Institutional Approval Signature

\_\_\_\_\_  
 Date

*President or Chief Academic Officer of the University*

### 1. Level of the Specialization (*place an "X" in the appropriate box*):

Baccalaureate       Master's       Doctoral

### 2. What is the nature/purpose of the proposed specialization?

The addition of a specialization in Bioinformatics to the Ph.D. in Biological Sciences will reflect an area of research interest and strength within the Department of Biology. Bioinformatics is a highly specialized area within Biology in which researchers work exclusively on large datasets that are often from a variety of sources. Most bioinformatics research is computationally intensive requiring expertise in Biology as well as Mathematics, Statistics, and Computer Science. Bioinformatics is a rapidly expanding area of study that is designed to analyze and interpret high-throughput biological data to understand complicated biological systems at different levels, through collaboration among scientists from diverse scientific backgrounds. At USD, the interactions have taken place between an interdepartmentally-based group of bioinformatics researchers that includes faculty and graduate students in Biology, Computer Science, Mathematical Sciences, Basic Biomedical Sciences, and Biomedical Engineering: <http://www.usd.edu/research/researchers-and-topics/bioinformatics>.

### 3. Provide a justification for the specialization, including the potential benefits to students and potential workforce demand for those who graduate with the credential.<sup>1</sup>

<sup>1</sup> For workforce related information, please 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.

The primary focus of the bioinformatics specialization is to provide PhD students in Biological Sciences with the opportunity to participate in a high level of research in bioinformatics and computational biology, with collaborative interactions and shared techniques in computational methods and algorithms, genomics, systems biology, large scale sequencing, and genetics. Doctoral students in this specialization will complete a dissertation with Bioinformatics as the primary focus.

The addition of this specialization will facilitate the overall level of bioinformatics scholarship and interdisciplinary research activity on campus. It is also likely to have the added value of attracting and retaining high quality graduate students interested in pursuing the doctorates in Biology while obtaining a specialization in Bioinformatics. With a seemingly endless stream of big biological data being generated across sectors, there is growing demand for talented, experienced researchers at the crossroads of biology, statistics, and computer science. The addition of the Bioinformatics specialization in Biology PhD program will give our graduates tremendous competitive advantages on the academic job market. The U.S. Bureau of Labor Statistics anticipates job growth in Bioinformatics to be 11% over the next 8 years.<sup>2</sup>

**4. List the proposed curriculum for the specialization (including the requirements for completing the major – *highlight courses in the specialization*):**

<b>Biology, Ph.D. , Bioinformatics Specialization</b>				
<b>Prefix</b>	<b>Num</b>	<b>Course Title</b>	<b>Cr Hrs</b>	<b>New</b>
<b>Core Curriculum</b>				
<b>BIOL</b>	5xx 6xx 7xx	Biology courses to include: <ul style="list-style-type: none"> <li>• BIOL 890 Graduate Seminar in Biology: 4-5 cr. ^</li> <li>• BIOL/NSCI 792 Topics in Biology: 2+ cr. with a minimum of two different one cr. courses</li> <li>• <b>BIOL 792 Topics in Biology (should be on a theme related to bioinformatics, computational biology, genomics, or systems biology): 2+ cr.</b></li> <li>• BIOL 898 Dissertation Research in Biology: 24-40 cr.</li> <li>• <b>Select Optional Specialization (Bioinformatics, Neuroscience, or Integrative Biology): 15-16 cr.</b></li> </ul>	<b>60</b>	No
Supporting courses approved by advisory committee			<b>0-12</b>	
^No more than 5 cr hrs. of BIOL 890 will count toward the program of study. <ul style="list-style-type: none"> <li>• NSCI 792/other topics courses will fulfill the four course topics requirement. Courses taken under a different prefix will be considered supporting coursework and will not count toward the required 60 credit hours of BIOL courses.</li> <li>• 50% of the program of study must be at the 700-level or above.</li> <li>• Up to 18 credit hours from a previous master's degree can be applied towards Biology or supporting courses.</li> </ul>				
<b>Total Core</b>			<b>60</b>	

<sup>2</sup> <https://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm>

<b>Required Courses for the Specialization: Bioinformatics</b>				
BIOL	780	Bioinformatics Computing and Applications	3	Yes
BIOL	769	Programming for Biology	3	Yes
BIOL	720/L	Survey of Biostatistical Methods plus lab	4	No
<b>Choose 6 credit hours of the following:</b>				
BIOL	770	Computational Genomics and Systems Biology	3	Yes
BIOL	781	Data Mining in Bioinformatics	3	Yes
Advisory committee approved elective in Bioinformatics			3-6	No
<b>Required Specialization Subtotal</b>			<b>16</b>	
Total number of hours optional Bioinformatics specialization			16	
Total number of hours required for completion of major			72	
Total number of hours required for completion of degree			72	

5. Complete the following charts to indicate if the university intends to seek authorization to deliver the entire specialization at any off-campus location (e.g., UC Sioux Falls, Capital University Center, Black Hills State University-Rapid City, etc.) or intends to seek authorization to deliver the entire specialization through distance technology (e.g., as an on-line program)?<sup>3</sup>

	Yes/No	If Yes, list location(s), including the physical address	Intended Start Date
<b>Off-campus</b>	No		

	Yes/No	If Yes, identify delivery methods	Intended Start Date
<b>Distance Delivery</b>	No		

6. **Additional Information:** Additional information is optional. Use this space to provide pertinent information not requested above. Limit the number and length of additional attachments. Identify all attachments with capital letters. Letters of support are not necessary and are rarely included with Board materials. The University may include responses to questions from the Board or the Executive Director as appendices to the original proposal where applicable. Delete this item if not used.

<sup>3</sup> The accreditation requirements of the Higher Learning Commission (HLC) require Board approval for a university to offer programs off-campus and through distance delivery.