

SOUTH DAKOTA BOARD OF REGENTS

Academic and Student Affairs

AGENDA ITEM: 6 – E

DATE: May 9, 2023

SUBJECT

Program Modifications Requiring Board Approval – BHSU

CONTROLLING STATUTE, RULE, OR POLICY

[BOR Policy 2:23](#) – New Programs, Program Modifications, Curricular Requests, and Inactivation/Termination

[AAC Guideline 2.3](#) – Substantive Program Modifications

[AAC Guideline 2.3.A](#) – Institutional Substantive Program Modification Requests Summary

BACKGROUND / DISCUSSION

Black Hills State University (BHSU) has submitted the following program modification proposal provided in Attachment I. Per AAC Guideline 2.3, certain substantive program modifications may require Board approval. Institutions may submit substantive program modifications to the Board after approval from the Executive Director, following a review by the System Associate VP for Academic Programming. These requests are also available on the [Institutional Substantive Program Modification Requests Webpage](#).

Existing Program: Substantive Program Modifications Requiring Board Approval

- Physical Science (BS) – *request to change total credits required within the discipline, total credits of supportive course work, total credits of elective course work, total credits required for program, program name, CIP code. The Physical Science BS is changing to a Physics program, and will join the collaborative Physics program with SDSMT, SDSU, and USD.*

IMPACT AND RECOMMENDATION

Upon approval by the Board, the proposals will move forward for implementation and entry into Banner.

ATTACHMENTS

Attachment I – BHSU: Substantive Program Modification Requests Summary Form

DRAFT MOTION 20230509_6-E:

I move to approve BHSU’s program modification requests for the BS in Physical Science, as presented.



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ACADEMIC AFFAIRS FORMS**

Institutional Substantive Program Modification Requests

Institution: BHSU

Date: 03/28/2023

Institutional representatives should provide direct links to PDF documents for each of the program modification requests represented below. All requests should be posted on the campus Curriculum and Instruction website one week prior to the Academic Affairs Council meeting where the program modification request is being considered.

<i>Program Title (Substantive Changes Requiring Board Approval)</i>	<i>BOR Meeting</i>	<i>BOR Action</i>
Physical Science - changing to - Physics		

Program modifications referenced above require review by the Academic Affairs Council and approval from the Board of Regents before they may be advanced forward for entry in the student information system. They should be listed separately in posting prior to the Academic Affairs Council meeting.

Signature: System Vice President for Academic Affairs

Date



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ACADEMIC AFFAIRS FORMS**

Substantive Program Modification Form

Use this form to request minor changes in existing programs (majors, minors, certificates, or specializations).

UNIVERSITY:	BHSU
CURRENT PROGRAM DEGREE:	B.S.
CURRENT PROGRAM MAJOR/MINOR:	Physical Science
CURRENT SPECIALIZATION (If applicable):	
CIP CODE:	Change from 40.0101 to 40.0801
UNIVERSITY DEPARTMENT:	BHSU School of Natural Sciences
BANNER DEPARTMENT CODE:	BSNS
UNIVERSITY COLLEGE:	College of Business and Natural Sciences
BANNER COLLEGE CODE:	6B

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.

Click here to enter a
date.

Vice President of Academic Affairs or
President of the University

Date

1. This modification addresses a change in (place an "X" in the appropriate box):

- | | |
|---|---|
| <input checked="" type="checkbox"/> Total credits required within the discipline
<input checked="" type="checkbox"/> Total credits of elective course work
<input checked="" type="checkbox"/> Program name
<input checked="" type="checkbox"/> CIP Code
<input type="checkbox"/> Modification requiring Board of Regents approval
<i>Must have prior approval from Executive Director or designee</i> | <input checked="" type="checkbox"/> Total credits of supportive course work
<input checked="" type="checkbox"/> Total credits required for program
<input type="checkbox"/> Existing specialization
<input type="checkbox"/> Other (explain below) |
|---|---|

2. **Effective date of change: 8/1/2023**

3. **Program Degree Level (place an "X" in the appropriate box):**

Associate Bachelor's Master's Doctoral

4. **Category (place an "X" in the appropriate box):**

Certificate Specialization Minor Major

5. **If a name change is proposed, the change will occur (place an "X" in the appropriate box):**

- On the effective date for all students
- On the effective date for students new to the program (enrolled students will graduate from existing program)

Proposed new name: Physics

Reminder: Name changes may require updating related articulation agreements, site approvals, etc.

6. **Is the program being modified associated with a current articulation agreement?**

Yes No

a. **If yes, will the articulation agreement need to be updated with the partner institution following the approve of the program change? Please explain:**

7. **Primary Aspects of the Modification (add lines or adjust cell size as needed):**

See attached Proposed Change table (last pages of this document)

Existing Curriculum: Physical Science

*Proposed Curriculum (highlight changes):
Physics*

Pref.	Num.	Title	Cr. Hrs.	Pref.	Num.	Title	Cr. Hrs.
		Please see Document below				Please see Document below	
Total number of hours required for major, minor, or specialization			60	Total number of hours required for major, minor, or specialization			66
Total number of hours required for degree			120	Total number of hours required for degree			120

8. **Explanation of the Change:** All but three restricted elective courses that were listed for the Physical Science program are being removed from the program. Eight PHYS courses, two

MATH courses and one CSC course are being added to the required courses for the Physics program. Six PHYS courses are being added to the choices for the restricted electives in the Physics program.

For substantial modifications requiring Board approval, complete the items below. References to external sources should be documented with a footnote (including web addresses where applicable).

9. Date of approval from the Executive Director or designee.
June 28, 2022 (Dr. Pam Carriveau, Interim Provost, approved moving forward with the proposal)
10. Identify the program modification requested.
This request is to change the existing Physical Science Program to a Physics Program and join the collaborative Physics degree with USD, SDSU, and SDSMT.
11. Provide justification for the desired modification.

First and foremost, this change would benefit students. BHSU students graduating with Physical Science degrees have a disadvantage compared to students graduating with Physics degrees when applying for jobs in industry and for graduate school, simply due to the name of the degree. However, these Physical Science students take the same classes via DDN that students at SDSMT, USD and SDSU take to receive their Physics degrees. Students will have better job prospects with a Physics degree rather than a Physical Science degree.

There is justification at the Regental and Institutional level as well.

Institutional Need: Relationship with the Sanford Underground Research Facility

BHSU has developed significant research and outreach programs closely connected with the Sanford Underground Research Facility (SURF). Experiments located on the 4850' level of SURF explore some of the most challenging questions facing 21st century physics, including the dominance of matter over antimatter, the nature of dark matter, and properties of neutrinos, and the opportunities at SURF are growing. The BHSU Underground Campus is a cleanroom facility which houses low background counters that are vital to underground science experiments at SURF¹. Faculty and students are a regular and important presence at SURF to continue the success of collaborative low background counting there. BHSU is a member of the LZ collaboration and made significant and vital contributions² to that collaboration. BHSU faculty have also been asked to join three other underground science collaborations in recognition of the valuable contributions they make to experiments. To continue this successful relationship, it is important to keep providing student researchers.

Students in turn benefit through their research at BHSU, gaining valuable experiences, analytical skills and technical skills, which are highly translatable into the workforce. Undergraduate research is a vitally important part of undergraduate education. It has been shown to increase student retention and intellectual curiosity, as well as research and communications skills. Not only are students who participate in undergraduate research more likely to finish their degree, but also to be successful in graduate school. Students also report

¹ Black Hills State University Underground Campus, B.J. Mount et al., Appl Radiat Isot., 126, 130 (2017).

² The LUX-ZEPLIN (LZ) Radioactivity and Cleanliness Control Programs, [LZ Collaboration], Eur. Phys. J. C, 80, 1044 (2020). <https://arxiv.org/abs/2006.02506>

research as being helpful in determining which discipline in which to enter and in gaining valuable skills not taught in classes. BHSU has recognized this importance in its Mission Statement as well as its Strategic Plan.

Institutional Need: Maintaining National Recognition

Physics faculty at BHSU fill national roles within the physics community. These roles include a faculty member being appointed as a co-convenor of an Underground Facilities Topical Group for the Snowmass study. “The Particle Physics Community Planning Exercise (a.k.a. “Snowmass”) is organized by the Division of Particles and Fields (DPF) of the American Physical Society. Snowmass is a scientific study. It provides an opportunity for the entire particle physics community to come together to identify and document a scientific vision for the future of particle physics in the U.S. and its international partners. Snowmass will define the most important questions for the field of particle physics and identify promising opportunities to address them. The P5, Particle Physics Project Prioritization Panel, will take the scientific input from Snowmass and develop a strategic plan for U.S. particle physics that can be executed over a 10 year timescale, in the context of a 20-year global vision for the field”.³

In addition to being recognized nationally as an expert for the Snowmass study, BHSU faculty have been elected to education and outreach leadership activities nationally. BHSU faculty members currently serve on the National Organizing Committee Leadership Group for the Conference for Undergraduate Women in Physics (CUWiP)⁴, which oversees the execution of 10-15 regional CUWiPs around the country each year as well as develop best practices and other national strategies for CUWiPs. Faculty are also on the Executive Committee of the NSF Physics REU Leadership Group (NPRLG), which is “committed to enhancing undergraduate student research experiences through cooperative engagement of the Physics REU site directors”.⁵

Regental Need: Added Graduates in the Collaborative Physics Program

USD, SDSU and SDSMT are engaged in a state-wide Physics degree program, which shares upper division physics classes among the institutions. Converting BHSU’s Physical Science program to a membership in the collaborative Physics degree would increase the number of students graduating with Physics degrees by at least 1-2 students per year. BHSU faculty would also be able to take a share in teaching the upper division physics courses, which would alleviate some stress on the other participating institutions.

Regental Need: Supporting SURF

Need for physics expertise in South Dakota due to SURF

12. Would the requested modification require a change to the catalog description and/or the program learning outcomes? If so, describe.

Yes, the modification will require changes to both the catalog description, and to some of the learning outcomes. The catalog description and the learning outcomes will be consistent with a more traditional Physics program. This will mean removing the learning outcomes associated with courses that are being removed, such as chemistry and geology courses, and will add

³ <https://snowmass21.org/>

⁴ <https://www.aps.org/programs/women/cuwip/>

⁵ <https://www.aps.org/programs/education/undergrad/physicsreu/nprlg.cfm>

learning outcomes associated with the added required courses such as PHYS 312 Experimental Physics Design 1 and PHS 341 Thermodynamics.

13. Indicate the number of students currently enrolled in the program.

There are currently 4 students enrolled in the Physical Science program at BHSU.

14. Describe the real impact to students.

The real impact to students is in their ability to compete for positions in industry and graduate programs that require a Physics degree. BHSU students graduating with Physical Science degrees are disadvantaged compared to students graduating with Physics degrees simply due to the name of the degree. However, these Physical Science students take the same classes via DDN that students at SDSMT, USD and SDSU take to receive their Physics degrees. This change will ensure BHSU students completing the same coursework are no longer disadvantaged when applying for jobs in industry and for positions in graduate school. They will have better job prospects with a Physics degree rather than a Physical Science degree.

15. Describe the real impact to the university.

Students who are well informed know that the degree name “Physical Science” does not afford the same credibility as a “Physics” degree. This has resulted in the loss of prospective students throughout the 5 state region that would otherwise have considered attending BHSU for their undergraduate degree. Converting BHSU’s Physical Science program to a Physics degree would increase the number of students graduating with Physics degrees by at least 1-2 students per year. Additionally, like the other institutions in the collaborative Physics degree program, BHSU has a limited number of faculty to support the Physics courses. Having a Physics degree program BHSU would benefit the University by allowing BHSU to become part of the larger collaborative Physics program with USD, SDSU and SDSMT and leverage the resources available at BHSU with those of the other participating institutions.

16. Describe any cost associated with the program modification.

We do not anticipate any costs associated with the modification of this program.

17. Describe any risks and unintended consequences associated with the program modification.

We do not anticipate there being any risks or unintended consequences associated with changing the Physical Science program to a more traditional Physics program and joining the already approved Physics collaborative.

18. Would this modification be effective for current and future students, or only students who enroll following the change?

This modification would be effective for students who enroll following the change.

Proposed Change

<i>Existing Curriculum</i>				<i>Proposed Curriculum (highlight changes)</i>			
Pref.	Num.	Title	Cr. Hrs.	Pref.	Num.	Title	Cr. Hrs.
Required core: 26 credit hours				Required core: 58 credit hours			
CHEM	112/L	General Chemistry I/Lab	4	CHEM	112/L	General Chemistry I/Lab	4
CHEM	114/L	General Chemistry II/Lab	4	CHEM	114/L	General Chemistry II/Lab	4
				CSC	150	Computer Science	3
MATH	123	Calculus I	4	MATH	123	Calculus I	4
MATH	125	Calculus II	4	MATH	125	Calculus II	4
				MATH	225	Calculus III	4
				MATH	321	Differential Equations	3
PHYS	211/L	University Physics I/Lab	5	PHYS	211/L	University Physics I/Lab	5
PHYS	213/L	University Physics II/Lab	5	PHYS	213/L	University Physics II/Lab	5
				PHYS	312	Experimental Physics Design I	2
				PHYS	331	Intro to Modern Physics	3
				PHYS	341	Thermodynamics	3
				PHYS	343	Statistical Physics.	2
				PHYS	421	Electromagnetism	4
				PHYS	451	Classical Mechanics	4
				PHYS	471	Quantum Mechanics	3
				PHYS	490	Seminar	1
<i>Take 1 MATH from the following</i>			3-4	<i>Select 4 courses from the following:</i>			8 – 22
MATH	225	Calculus III (4)				REMOVE	
MATH	281	Introduction to Statistics (3)				REMOVE	
MATH	315	Linear Algebra (3)				REMOVE	
MATH	316	Discrete Mathematics (3)				REMOVE	
MATH	318	Advanced Discrete Mathematics (3)				REMOVE	
MATH	321	Differential Equations (3)				REMOVE	
MATH	373	Introduction to Numerical Analysis (3)				REMOVE	
MATH	413	Abstract Algebra (3)				REMOVE	

MATH	422	Complex Variables (3)				REMOVE	
MATH	487	Design of Experiments (3)				REMOVE	
<i>Select 6 courses from the following</i>			18-24				
CHEM	326/L	Organic Chemistry I/Lab (4)				REMOVE	
CHEM	328/L	Organic Chemistry II/Lab (4)				REMOVE	
CHEM	332/L	Analytical Chemistry/Lab (4)				REMOVE	
CHEM	342	Physical Chemistry I (3)				REMOVE	
CHEM	344	Physical Chemistry II (3)				REMOVE	
CHEM	434/L	Instrumental Analysis/Lab (3)				REMOVE	
CHEM	452	Inorganic Chemistry (3)				REMOVE	
CHEM	464	Biochemistry I (3)				REMOVE	
CSC	150	Computer Science I (3)				REMOVE	
CSC	250	Computer Science II (3)				REMOVE	
CSC	260	Object Oriented Design (3)				REMOVE	
CSC	300	Data Structures				REMOVE	
CSC	316	Discrete Mathematics (3)				REMOVE	
CSC	318	Advanced Discrete Mathematics (3)				REMOVE	
CSC	410	Parallel Computing (3)				REMOVE	
CSC	433	Computer Graphics (3)				REMOVE	
CSC	482	Algorithm Analysis (3)				REMOVE	
GEOL	201/L	Physical Geology/Lab (4)				REMOVE	
GEOL	310	Volcanology (3)				REMOVE	
GEOL	340	Mineralogy and Petrology (4)				REMOVE	
GEOL	370	Hydrogeology (3)				REMOVE	
				PHYS	321	Space Travel (3)	
PHYS	331	Introduction to Modern Physics (3)				REMOVE	
PHYS	341	Thermodynamics (2)				REMOVE	
PHYS	343	Statistical Physics (2)				REMOVE	
PHYS	361	Optics (3)		PHYS	361	Optics (3)	
PHYS	421	Electromagnetism (4)				REMOVE	
PHYS	424	Digital Electronics		PHYS	424	Digital Electronics (3)	

PHYS	433	Nuclear & Elementary Particle Physics (3)		PHYS	433	Nuclear & Elementary Particle Physics (3)	
				PHYS	439	Condensed Matter (4)	
PHYS	451	Classical Mechanics (4)				REMOVE	
				PHYS	454	Semiconductor Materials: Fundamentals & Fabrication (3)	
PHYS	471	Quantum Mechanics (4)				REMOVE	
PHYS	481	Mathematical Physics (4)		PHYS	481	Mathematical Physics (4)	
				PHYS	492	Topics (1-4)	
				PHYS	498	Undergraduate Research/Scholarship (1-12)	
SCI	388	GIS/GPS (3)				REMOVE	
<i>Select one course from the following</i>							
CHEM	490	Seminar	1			REMOVE	
ENGL	379	Technical Communication	3			REMOVE	
GEOL	490	Seminar	3			REMOVE	
<i>Select 12 credit hours from the following</i>			12			REMOVE	
CHEM	492	Topics (3-6)				REMOVE	
CHEM	498	Undergraduate Research (3-6)				REMOVE	
GEOL	392	Topics (3-6)				REMOVE	
PHSI	492	Topics (3-6)				REMOVE	
PHSI	498	Undergraduate Research (3-6)				REMOVE	
PHYS	492	Topics (3-6)				REMOVE	
PHYS	498	Undergraduate Research (3-6)				REMOVE	
SCI	492	Topics (3-6)				REMOVE	
SCI	498	Undergraduate Research (3-6)				REMOVE	
Total number of hours required for major, minor, or specialization			60-69	Total number of hours required for major, minor, or specialization			66-80
Total number of hours required for degree			120	Total number of hours required for degree			120

Requirement for a Minor: 15 of 18 credits required for a minor in Mathematics is earned through this program. A minor in Mathematics can be obtained by taking an additional 3 credits of MATH from the list below:

- 3 MATH 315 Linear Algebra
- 3 MATH 316 Discrete Mathematics
- 3 MATH 351 Foundations of Mathematics
- 3 MATH 361 Modern Geometry
- 3 MATH 411 Theory of Numbers
- 3 MATH 413 Abstract Algebra I
- 3 MATH 416 Combinatorics
- 3 MATH 421 Complex Analysis
- 3 MATH 423 Advanced Calculus I
- 3 MATH 440 Mathematics of Finance
- 3 MATH 450 History of Mathematics
- 3 MATH 461 Introduction to Topology
- 3 MATH 481 Probability and Statistics
- 3 MATH 487 Design of Experiments

Students wishing to minor in something other than Mathematics may do so. To minor in an area other than Mathematics and graduate within the 120 credits required for a BS degree students will need to work with their professional advisors and faculty mentors to ensure that the total number of restricted PHYS elective credits taken is 8 – 14. This will leave room in the student's program to apply the remaining 18 – 24 credits to a minor of their choosing. With careful scheduling, it is even possible for a student to graduate with 2 minors, one in Mathematics, and one in a second area of their choosing.