



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

**Substantive Program Modification Program**

<b>UNIVERSITY:</b>	<b>SDSU</b>
<b>CURRENT PROGRAM TITLE:</b>	<b>Physics (B.S.) [S.BS.PHY] - Science Teaching Specialization [S.BS.PHY-ST]</b>
<b>CIP CODE:</b>	<b>40.0801</b>
<b>UNIVERSITY DEPARTMENT:</b>	<b>Physics</b>
<b>UNIVERSITY DIVISION:</b>	<b>Natural 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.*

Dennis D. Hedge

5/8/18

\_\_\_\_\_  
Vice President of Academic Affairs or  
President of the University

\_\_\_\_\_  
Date

**1. This modification addresses a change in:**

- |   |   |
|---|---|
| <input type="checkbox"/> Total credits required within the discipline | <input type="checkbox"/> Total credits of supportive course work                              |
| <input type="checkbox"/> Total credits of elective course work        | <input type="checkbox"/> Total credits required for program                                   |
| <input type="checkbox"/> Program name                                 | <input checked="" type="checkbox"/> Existing specialization                                   |
| <input type="checkbox"/> CIP Code                                     | <input checked="" type="checkbox"/> Other: Restructure of College and Department Requirements |

**2. Effective date of change: 2018-2019 Academic Year**

**3. Program Degree Level:**

Associate  Bachelor's  Master's  Doctoral

**4. Category:**

Certificate  Specialization  Minor  Major

**5. If a name change is proposed, the change will occur:**

- 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:** \_\_\_\_\_

**6. Primary Aspects of the Modification:**

*Existing Curriculum*

*Proposed Curriculum (highlight changes)*

Pref.	Num.	Title	Cr. Hrs.	Pref.	Num.	Title	Cr. Hrs.
		<b>Systems General Education Requirements</b>	<b>33</b>			<b>Systems General Education Requirements</b>	<b>33</b>
	6	SGR 1 – Written Communication ENGL 101 Composition I (3) AND ENGL 201 Composition II (3) OR ENGL 277 Technical Writing in Engineering (3)	6		6	SGR 1 – Written Communication ENGL 101 Composition I (3) AND ENGL 201 Composition II (3) OR ENGL 277 Technical Writing in Engineering (3)	6
	3	SGR 2 – Oral Communication SPCM 101 Fundamentals of Speech	3		3	SGR 2 – Oral Communication SPCM 101 Fundamentals of Speech	3

*Existing Curriculum*

*Proposed Curriculum (highlight changes)*

SGR 3 – Social Sciences/Diversity <i>Science Teaching:</i> GEOG 210 World Regional Geography (3)			6	SGR 3 – Social Sciences/Diversity <i>Science Teaching:</i> GEOG 210 World Regional Geography (3)			6
SGR 4 – Humanities and Arts/Diversity <i>Science Teaching:</i> PHIL 200 Introduction to Logic (3)			6	SGR 4 – Humanities and Arts/Diversity <i>Science Teaching:</i> PHIL 200 Introduction to Logic (3)			6
SGR 5 – Mathematics Math 123Calculus I			4	SGR 5 – Mathematics Math 123Calculus I			4
SGR 6 – Natural Sciences PHYS 111-111L Introduction to Physics I & Lab (4) AND PHYS 113-113L Introduction to Physics II & Lab (4) or PHYS 211-211L University Physics I & Lab (4) AND PHYS 213-213L University Physics II & Lab (4)			8	SGR 6 – Natural Sciences PHYS 111-111L Introduction to Physics I & Lab (4) AND PHYS 113-113L Introduction to Physics II & Lab (4) or PHYS 211-211L University Physics I & Lab (4) AND PHYS 213-213L University Physics II & Lab (4)			8
<b>A&amp;S College Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>			<b>13+</b> <b>3</b>	<b>Department Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>			<b>13+</b> <b>3</b>
Natural Sciences (10+) Satisfying coursework must include - at least two classes with laboratory components - at least two different prefixes <i>(MATH and STATS courses do not count toward the Science requirement.)</i> <i>(6 credits of SGR #6 are counted toward this goal and 4 credits of major coursework)</i>			<b>10+</b> <b>0</b>	Natural Sciences (10+) Satisfying coursework must include - at least two classes with laboratory components - at least two different prefixes <i>(MATH and STATS courses do not count toward the Science requirement.)</i> <i>(6 credits of SGR #6 are counted toward this goal and 4 credits of major coursework)</i>			<b>10+</b> <b>0</b>
<i>Physics:</i> A&S 111 Introduction to Global Citizenship and Diversity (3) <i>Science Teaching Specialization:</i> AIS 211 South Dakota American Indian Culture and Education (3)			3	<i>Physics:</i> <b>AHSS</b> 111 Introduction to Global Citizenship and Diversity (3) <i>Science Teaching Specialization:</i> AIS 211 South Dakota American Indian Culture and Education (3)			3
One declared minor outside of the major prefix OR a second major OR a teaching specialization. The minor may be a traditional minor within one department or it may be interdisciplinary involving more than one department. The minor can be in a different college. The minor must be declared no later than the student's third semester of enrollment.			-	One declared minor outside of the major prefix OR a second major OR a teaching specialization. The minor may be a traditional minor within one department or it may be interdisciplinary involving more than one department. The minor can be in a different college. The minor must be declared no later than the student's third semester of enrollment.			-
Capstone course within major PHYS 490 Seminar			-	Capstone course within major PHYS 490 Seminar			-
Upper Division Credits (300-400 level coursework inside and outside of the major)			33	Upper Division Credits (300-400 level coursework inside and outside of the major)			33
<b>Major Requirements</b>			<b>83-84</b>	<b>Major Requirements</b>			<b>83-84</b>
Major Core			43	Major Core			43
EE	216-216L	Linear Circuits I & Lab	4	EE	216-216L	Linear Circuits I & Lab	4
CHEM	112-112L	General Chemistry I & Lab	4	CHEM	112-112L	General Chemistry I & Lab	4
CHEM	114-114L	General Chemistry II & Lab	4	CHEM	114-114L	General Chemistry II & Lab	4
MATH	125	Calculus II	4	MATH	125	Calculus II	4
MATH	225	Calculus III	4	MATH	225	Calculus III	4
MATH	321	Differential Equations	3	MATH	321	Differential Equations	3
PHYS	119	First Year Seminar in Physics	1	PHYS	119	First Year Seminar in Physics	1
PHYS	316-316L	Measurement Theory and Experiment Design	2	PHYS	316-316L	Measurement Theory and Experiment Design	2
PHYS	331	Introduction to Modern Physics	3	PHYS	331	Introduction to Modern Physics	3
PHYS	341	Thermodynamics	2	PHYS	341	Thermodynamics	2
PHYS	343	Statistical Physics	2	PHYS	343	Statistical Physics	2
PHYS	421	Electromagnetism	4	PHYS	421	Electromagnetism	4
PHYS	451	Classical Mechanics	4	PHYS	451	Classical Mechanics	4

## Existing Curriculum

Proposed Curriculum (**highlight changes**)

PHYS	490	Seminar (Capstone)	2	PHYS	490	Seminar (Capstone)	2
Physics Requirements			5	Physics Requirements			5
CSC	150	Computer Science I	3	CSC	150	Computer Science I	3
PHYS	318	Advanced Laboratory I	2	PHYS	318	Advanced Laboratory I	2
Physics Technical Electives			36	Physics Technical Electives			36
Select one elective group based on career objectives.			36	Select one elective group based on career objectives.			36
<i>Group 1: Professional and Applied Physics</i>				<i>Group 1: Professional and Applied Physics</i>			
MATH	331	Advanced Engineering Math (3)	3-4	MATH	331	Advanced Engineering Math (3)	3-4
OR				OR			
PHYS	481	Mathematical Physics (4)		PHYS	481	Mathematical Physics (4)	
OR				OR			
STAT	381	Intro to Probability & Statistics (3)		STAT	381	Intro to Probability & Statistics (3)	
PHYS	418	Advanced Lab II	1	PHYS	418	Advanced Lab II	1
PHYS	471	Quantum Mechanics	4	PHYS	471	Quantum Mechanics	4
Technical Electives (up to a total of 3 credits may be NE/PHYS x94, x96, x98 total) Technical electives will be selected from the following list of approved courses. Any departures from this list must be approved by the Head of the Physics Department. One may <u>not</u> count a specific course required for an elective group as also counting towards elective credit requirements of the elective group.			19	Technical Electives (up to a total of 3 credits may be NE/PHYS x94, x96, x98 total) Technical electives will be selected from the following list of approved courses. Any departures from this list must be approved by the Head of the Physics Department. One may <u>not</u> count a specific course required for an elective group as also counting towards elective credit requirements of the elective group.			19
CHEM 332-332L Analytical Chemistry (4)				CHEM 332-332L Analytical Chemistry (4)			
EE 218-218L Linear Circuits II & Lab (4)				EE 218-218L Linear Circuits II & Lab (4)			
EE 222-222L Energy Conversion & Lab (4)				EE 222-222L Energy Conversion & Lab (4)			
EE 320-320L Electronics I (4)				EE 320-320L Electronics I (4)			
EM 321 Mechanics of Materials (3)				EM 321 Mechanics of Materials (3)			
EM 331 Fluid Mechanics (3)				EM 331 Fluid Mechanics (3)			
GE 121 Engineering Design Graphics (1)				GE 121 Engineering Design Graphics (1)			
GE 123 Computer Aided Drawing (1)				GE 123 Computer Aided Drawing (1)			
MATH 315 Linear Algebra (3)				MATH 315 Linear Algebra (3)			
MATH 331 Advanced Engineering Mathematics (3)				MATH 331 Advanced Engineering Mathematics (3)			
MATH 374 Scientific Computation I (3)				MATH 374 Scientific Computation I (3)			
ME 415 Heat Transfer (3)				ME 415 Heat Transfer (3)			
NE 435 Introduction to Nuclear Engineering (3)				NE 435 Introduction to Nuclear Engineering (3)			
PHIL 200 Logic (3)				PHIL 200 Logic (3)			
PHYS 185-185L Astronomy I and Lab (3)				PHYS 185-185L Astronomy I and Lab (3)			
PHYS 187-187L Astronomy II and Lab (3)				PHYS 187-187L Astronomy II and Lab (3)			
PHYS 361 Optics (3)				PHYS 361 Optics (3)			
PHYS 418 Advanced Laboratory II (1)				PHYS 418 Advanced Laboratory II (1)			
PHYS 433-533 Nuc. and Elem. Particle Physic (3)				PHYS 433-533 Nuc. and Elem. Particle Physic (3)			
PHYS 439-529 Solid State Physics (3-4)				PHYS 439-529 Solid State Physics (3-4)			
PHYS 471-571 Quantum Mechanics (4)				PHYS 471-571 Quantum Mechanics (4)			
PHYS 481 Mathematical Physics (4)				PHYS 481 Mathematical Physics (4)			
PHYS/NE 337 Foundations of Health Physics (3)				PHYS/NE 337 Foundations of Health Physics (3)			
PHYS/NE 494 Internship (1-3)				PHYS/NE 494 Internship (1-3)			
PHYS/NE 498 Undergraduate Research (1-3)				PHYS/NE 498 Undergraduate Research (1-3)			
STAT 381 Intro to Probability and Statistics (3)				STAT 381 Intro to Probability and Statistics (3)			
Free Electives			8-9	Free Electives			8-9
<i>Group 2: Health/Medical Physics</i>				<i>Group 2: Health/Medical Physics</i>			
BIOL	151-151L	General Biology I & Lab	4	BIOL	151-151L	General Biology I & Lab	4
BIOL	153-153L	General Biology II & Lab	4	BIOL	153-153L	General Biology II & Lab	4
BIOL	221-221L	Human Anatomy & Lab	4	BIOL	221-221L	Human Anatomy & Lab	4
BIOL	325-325L	Physiology & Lab	4	BIOL	325-325L	Physiology & Lab	4
CHEM	326-326L	Organic Chemistry I & Lab	4	CHEM	326-326L	Organic Chemistry I & Lab	4

## Existing Curriculum

Proposed Curriculum (*highlight changes*)

CHEM OR CHEM OR PHYS	328-328L 332-332L 471	Organic Chemistry II & Lab (4) Analytical Chemistry & Lab (4) Quantum Mechanics (4)	4	CHEM OR CHEM OR PHYS	328-328L 332-332L 471	Organic Chemistry II & Lab (4) Analytical Chemistry & Lab (4) Quantum Mechanics (4)	4
NE	337	Foundations of Health Physics	3	NE	337	Foundations of Health Physics	3
PHYS OR NE	433 435	Nuclear & Elementary Particle Physics (3) Intro to Nuclear Engineering (3)	3	PHYS OR NE	433 435	Nuclear & Elementary Particle Physics (3) Intro to Nuclear Engineering (3)	3
PHYS	418	Advanced Laboratory II	1	PHYS	418	Advanced Laboratory II	1
STAT	381	Introduction to Probability and Statistics	3	STAT	381	Introduction to Probability and Statistics	3
Free Electives			2	Free Electives			2
<i>Group 3: Flexible Emphasis</i>				<i>Group 3: Flexible Emphasis</i>			
Directed Electives			20	Directed Electives			20
Technical Electives (up to a total of 3 credits may be NE/PHYS x94, x96, x98 total) Technical electives will be selected from the following list of approved courses. Any departures from this list must be approved by the Head of the Physics Department. One may <u>not</u> count a specific course required for an elective group as also counting towards elective credit requirements of the elective group. CHEM 332-332L Analytical Chemistry (4) EE 218-218L Linear Circuits II & Lab (4) EE 222-222L Energy Conversion & Lab (4) EE 320-320L Electronics I (4) EM 321 Mechanics of Materials (3) EM 331 Fluid Mechanics (3) EM 331 Fluid Mechanics (3) GE 121 Engineering Design Graphics (1) GE 123 Computer Aided Drawing (1) MATH 315 Linear Algebra (3) MATH 315 Linear Algebra (3) MATH 331 Advanced Engineering Mathematics (3) MATH 374 Scientific Computation I (3) ME 415 Heat Transfer (3) NE 435 Introduction to Nuclear Engineering (3) PHIL 200 Logic (3) PHYS 185-185L Astronomy I and Lab (3) PHYS 187-187L Astronomy II and Lab (3) PHYS 361 Optics (3) PHYS 418 Advanced Laboratory II (1) PHYS 433 Nuc. and Elem. Particle Physics (3) PHYS 439 Solid State Physics (3-4) PHYS 471-571 Quantum Mechanics (4) PHYS 481 Mathematical Physics (4) PHYS/NE 337 Foundations of Health Physics (3) PHYS/NE 494 Internship (1-3) PHYS/NE 498 Undergraduate Research (1-3) STAT 381 Intro to Probability and Statistics (3)			7	Technical Electives (up to a total of 3 credits may be NE/PHYS x94, x96, x98 total) Technical electives will be selected from the following list of approved courses. Any departures from this list must be approved by the Head of the Physics Department. One may <u>not</u> count a specific course required for an elective group as also counting towards elective credit requirements of the elective group. CHEM 332-332L Analytical Chemistry (4) EE 218-218L Linear Circuits II & Lab (4) EE 222-222L Energy Conversion & Lab (4) EE 320-320L Electronics I (4) EM 321 Mechanics of Materials (3) EM 331 Fluid Mechanics (3) EM 331 Fluid Mechanics (3) GE 121 Engineering Design Graphics (1) GE 123 Computer Aided Drawing (1) MATH 315 Linear Algebra (3) MATH 315 Linear Algebra (3) MATH 331 Advanced Engineering Mathematics (3) MATH 374 Scientific Computation I (3) ME 415 Heat Transfer (3) NE 435 Introduction to Nuclear Engineering (3) PHIL 200 Logic (3) PHYS 185-185L Astronomy I and Lab (3) PHYS 187-187L Astronomy II and Lab (3) PHYS 361 Optics (3) PHYS 418 Advanced Laboratory II (1) PHYS 433 Nuc. and Elem. Particle Physics (3) PHYS 439 Solid State Physics (3-4) PHYS 471-571 Quantum Mechanics (4) PHYS 481 Mathematical Physics (4) PHYS/NE 337 Foundations of Health Physics (3) PHYS/NE 494 Internship (1-3) PHYS/NE 498 Undergraduate Research (1-3) STAT 381 Intro to Probability and Statistics (3)			7
Free Electives			9	Free Electives			9
Science Teaching Specialization Requirements				Science Teaching Specialization Requirements			
PHY S OR PHY S	185 187	Astronomy I and Lab (3) Astronomy II and Lab (3)	3	PHYS OR PHYS	185 187	Astronomy I and Lab (3) Astronomy II and Lab (3)	3

## Existing Curriculum

## Proposed Curriculum (highlight changes)

PHY S	337	Foundations of Health Physics	3	PHYS	337	Foundations of Health Physics	3
<b>Teaching Specialization Requirements</b>			<b>34</b>	<b>Teaching Specialization Requirements</b>			<b>34</b>
AIS	211	South Dakota American Indian Culture and Education (College Requirements)	-	AIS	211	South Dakota American Indian Culture and Education (Department Requirements)	-
EDFN	101	Exploration of Teaching & Learning	1	EDFN	101	Exploration of Teaching & Learning	1
EDFN	351	Teaching & Learning I	1	EDFN	351	Teaching & Learning I	1
EDFN	352	Teaching & Learning II	3	EDFN	352	Teaching & Learning II	3
EDFN	352L	Teaching & Learning II Lab	2	EDFN	352L	Teaching & Learning II Lab	2
EDFN	453	Teaching & Learning III	5	EDFN	453	Teaching & Learning III	5
EDFN	453L	Teaching & Learning III Lab	2	EDFN	453L	Teaching & Learning III Lab	2
EDFN	454	Teaching & Learning IV	11	EDFN	454	Teaching & Learning IV	11
EDFN	475	Human Relations	3	EDFN	475	Human Relations	3
SEED	413	7-12 Science Methods	3	SEED	413	7-12 Science Methods	3
SEED	450	7-12 Reading & Content Literacy	2	SEED	450	7-12 Reading & Content Literacy	2
SEED	456	Capstone/Action Research	1	SEED	456	Capstone/Action Research	1
<b>Electives</b> (Taken as needed to complete any additional degree requirements)			<b>0-1</b>	<b>Electives</b> (Taken as needed to complete any additional degree requirements)			<b>0-1</b>
The program requires a cumulative GPA of 2.0 or above for all physics courses and a GPA or above in PHYS 211-213 (or PHYS 111-113) and PHYS 331.				The program requires a cumulative GPA of 2.0 or above for all physics courses and a GPA or above in PHYS 211-213 (or PHYS 111-113) and PHYS 331.			

## Summary of Credits Physics (B.S.)

<b>System General Education Requirements</b>	<b>33</b>	<b>System General Education Requirements</b>	<b>33</b>
<b>A&amp;S College Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>	<b>13+</b> <b>3</b>	<b>A&amp;S College Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>	<b>13+</b> <b>3</b>
		<b>Department Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>	<b>13+</b> <b>3</b>
<b>Majors Requirements</b>	<b>84</b>	<b>Majors Requirements</b>	<b>84</b>
Major Core (43)		Major Core (43)	
Physics Requirements (5)		Physics Requirements (5)	
Technical Electives (36)		Technical Electives (36)	
<b>Electives</b> (Taken as needed to complete any additional degree requirements)	<b>0</b>	<b>Electives</b> (Taken as needed to complete any additional degree requirements)	<b>0</b>

## Summary of Credits Physics (B.S.) – Science Teaching Specialization

<b>System General Education Requirements</b>	<b>33</b>	<b>System General Education Requirements</b>	<b>33</b>
<b>A&amp;S College Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>	<b>13+</b> <b>3</b>	<b>A&amp;S College Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>	<b>13+</b> <b>3</b>
		<b>Department Requirements</b> <i>Additional required credits of coursework beyond SGRs, Major, and Support Courses</i>	<b>13+</b> <b>3</b>
<b>Majors Requirements</b>	<b>83</b>	<b>Majors Requirements</b>	<b>83</b>
Major Core (43)		Major Core (43)	
<b>Science Teaching Specialization Requirements (6)</b>		<b>Science Teaching Specialization Requirements (6)</b>	
<b>Teaching Specialization Requirements (34)</b>		<b>Teaching Specialization Requirements (34)</b>	
<b>Electives</b> (Taken as needed to complete any additional degree requirements)	<b>1</b>	<b>Electives</b> (Taken as needed to complete any additional degree requirements)	<b>1</b>
Total number of hours required for major and specialization	83-84	Total number of hours required for major and specialization	83-84
Total number of hours required for degree	120	Total number of hours required for degree	120

## **7. Explanation of the Change:**

The Department of Physics will move from the College of Arts & Sciences to the College of Natural Sciences effective July 1, 2018. The College of Arts & Sciences requirements have been realigned as department requirements within the program. Additional changes include:

- The College of Arts & Sciences has been restructured and renamed the College of Arts, Humanities, and Social Sciences. The A&S prefix has also been replaced with the AHSS prefix to make it easier to identify the coursework.