



ACADEMIC AFFAIRS GUIDELINES

Section 2:	Programs and Curriculum	
Title:	Collaborative Physics Undergraduate Program Administration	
Number (Current Format)	Number (Prior Format)	Date Last Revised
2.19.B	N/A	07/2021
Reference:		
Related Form(s):		

1. Collaborative Purpose

The ability to maintain a vibrant set of Physics degree program options for students in South Dakota continues to be of critical interest to the South Dakota Board of Regents (SDBOR). As a result, the SDBOR has established a framework within both policy and guidelines to encourage institutions to identify collaborative opportunities that will allow for the sharing of faculty resources, expertise and infrastructure to improve efficiencies and reduce unnecessary duplication. Specifically [Program Productivity](#)¹ and [Section Size](#)² policies and guidelines have created exemptions to foster an environment for faculty across institutions to collaborate on common degree programs. Within this context, the purpose of the Collaborative Physics Program is to provide a framework for the common delivery of Physics programs (both face-to-face and via distance) by the South Dakota School of Mines & Technology, South Dakota State University, and the University of South Dakota. Black Hills State University offers elective courses in their Physical Science major which may apply to the Physics degree programs at USD, SDSU, and SDSM&T. Students at BHSU may elect to participate in courses within this collaborative to meet core or elective requirements for their Physical Science major, and USD, SDSU, and SDSM&T agree to allow students to participate in elective courses from BHSU.

2. Partners & Institutional Leads

- 2.1. Participating Institutions: South Dakota School of Mines & Technology, South Dakota State University, and the University of South Dakota.
- 2.2. Each participating institution will identify a designated institutional representative appointed by the Chief Academic Affairs Officer who will be responsible for coordinating activities with other partner institutions pursuant to the terms of this agreement.

¹ Section 3 of the Program Productivity Review Guidelines establishes that degree programs flagged for review may explore options for degree program consolidation. When this coordination occurs and institutions can provide “Evidence that multi-institution collaboration will meet graduate production thresholds,” benchmarks can be achieved by the sum of all graduates at the participating institutions.

² Section 2.6 of current AAC Section Size Guidelines established that “Collaborative courses with a selected instructional method code that result from a shared program agreement among Regental institutions shall be excluded.”

- 2.3. Changes to the agreement may be made from time-to-time and must be agreed upon the designated institutional representatives.

3. Common Assessment Structure

3.1. Common Cross Curricular Skills

3.1.1. Board of Regents [Policy 2:11 – Assessment](#) specifies that all undergraduate degree programs within the Regental system will draw from a common set of cross-curricular skills. Faculty shall select a minimum of five of the approved cross-curricular skills and develop learning outcomes specific to their program that align with the common definitions outlined in BOR policy.

3.1.2. The participating institutions in the collaborative will assess a common set of cross-curricular skills to ensure greater coordination across the courses delivered to students in the program. The designated cross-curricular skills include:

3.1.2.1. *Critical & Creative Thinking*: A habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion. Both the capacity to combine or synthesize existing ideas, images, or expertise in original ways and the experience of thinking, reacting, and working in an imaginative way characterized by a high degree of innovation, divergent thinking, and risk taking.

3.1.2.2. *Inquiry and Analysis*: A systematic process of exploring issues, objects or works through the collection and analysis of evidence that results in informed conclusions or judgments. Analysis is the process of breaking complex topics or issues into parts to gain a better understanding of them.

3.1.2.3. *Information Literacy*: The ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively and responsibly use and convey that information to address the need or problem at hand.

3.1.2.4. *Teamwork*: Behaviors under the control of individual team members - effort they put into team tasks, their manner of interacting with others on team, and the quantity and quality of contributions they make to team discussions.

3.1.2.5. *Problem Solving*: The process of designing, evaluating and implementing a strategy to answer an open-ended question or achieve a desired goal.

3.1.3. Participating institutions shall have the flexibility to identify and assess additional cross-curricular skills that align with institutional priorities, but deviation from the five skills outlined in 3.1.2 of this agreement must be approved by the participating members of the consortium.

3.1.4. Participating institutions agree to develop similar learning outcomes that align with each of the approved cross-curricular skills, and maintain rubrics that evaluate student competency on three general levels.

3.2. Individual Program Assessment

3.2.1. Participating institutions in the collaborative will assess a common set of program learning outcomes to ensure greater coordination across the courses delivered to students in the program. The program will assess a student's ability to

3.2.1.1. Understand and apply the principles and theories of physics: Students will demonstrate competency in explaining and applying basic laws of physics in classical and quantum mechanics, electricity and magnetism, thermodynamics and statistical

mechanics and special relativity, and the applications of these laws in areas such as optics, condensed matter physics, properties of materials, nuclear and particle physics, and other disciplines.

3.2.1.2. Design experiments and analyze data: Students will demonstrate competency in designing experiments; building and using equipment; gathering, analyzing and interpreting experimental data; and drawing conclusions based upon the data.

3.2.2. Each measure will be assessed utilizing appropriate instruments and methods for the discipline. Where possible, participating institutions will employ the use of nationally recognized standardized exams.

3.2.3. Participating institutions agree to a collaborative process where assessment results are annually exchanged and discussed.

3.2.4. Participating institutions wishing to change or modify assessment protocols must receive approval from the other institution before implementation.

4. Curriculum

4.1. A common curriculum will be used by participating institutions that includes a core for students consisting of 46-48 credit hours required for the degree program (24-26 credit hours of core physics courses and 22 credit hours of other core requirements). Additional college or university requirements beyond the core are allowed, depending on specific tracks at the individual institutions. The core will include introductory courses taught individually at each institution as well as an upper-division shared core curriculum. Changes to the core will be made only if approved by the participating members of the consortium.

4.2. The introductory core curriculum shall include

4.2.1. PHYS 211 – University Physics I, 3-4 credits

4.2.2. PHYS 211L – University Physics I Laboratory, 1 credit

4.2.3. PHYS 213 – University Physics II, 3-4 credits

4.2.4. PHYS 213L – University Physics II Laboratory, 1 credit

4.2.5. PHYS 331 (PHYS 431 at USD) – Introduction to Modern Physics, 3 credits

4.2.6. CHEM 112 – General Chemistry I, 3 credits

4.2.7. CHEM 112L – General Chemistry I Laboratory, 1 credit

4.2.8. MATH 123 -- Calculus I, 4 credits

4.2.9. MATH 125 – Calculus II, 4 credits

4.2.10. MATH 225 – Calculus III, 4 credits

4.2.11. MATH 321 – Differential Equations, 3 credits

4.2.12. CSC 150/155/170 – Introduction to Computer Science & Programming, 2 credits

4.2.13. CSC 150L/155L/170L – Introduction to Computer Science & Programming Laboratory, 1 credit

4.3. The upper-division shared core curriculum shall include

4.3.1. PHYS 341 (PHYS 441 at USD)– Thermodynamics, 2 credits

4.3.2. PHYS 421 – Electromagnetism, 4 credits

- 4.3.3. PHYS 451 – Classical Mechanics, 4 credits
- 4.3.4. PHYS 471 – Quantum Mechanics, 4 credits
- 4.4. Additional shared upper-division courses, required by some tracks and electives for others, shall include
 - 4.4.1. PHYS 343 (PHYS 443 at USD) – Statistical Physics, 2 credits
 - 4.4.2. PHYS 361 (PHYS 461 at USD) – Optics, 3 credits
 - 4.4.3. PHYS 433 – Nuclear and Elementary Particle Physics, 3 credits
 - 4.4.4. PHYS 439 – Condensed Matter Physics, 4 credits
 - 4.4.5. PHYS 481 – Mathematical Physics, 4 credits
- 4.5. Each track will include a required capstone.
- 4.6. Shared Curriculum Matrix
 - 4.6.1. Beginning with the Fall 1996 term a multi-year shared curriculum matrix has been developed that identifies the institutions responsible for the delivery of shared core and elective courses for the program (see appendix A; institutions can revise as needed by agreement).
 - 4.6.2. The rotation will include the delivery of courses offered during the Fall and Spring terms, and ensure equal distribution of course offerings across institutions that also ensures that students may successfully complete the degree requirements in a timely fashion.

5. Textbook & Instructional Resources

- 5.1. Consistent with [BOR Policy 1:11 – Academic Freedom and Responsibility](#) institutional faculty are given academic freedom to select textbook and instructional materials they deem appropriate for the upper division coursework delivered through the consortium.
- 5.2. Faculty from each institution teaching 100 and 200 level course required in the core curriculum will utilize a common set of textbooks and instructional materials. These instructional resources will be selected by a team of faculty with representation from each institution.
 - 5.2.1. Once selected, an instructional resource committee will be tasked with routinely evaluating the viability of the resources for meeting established learning outcomes and/or cross curricular skills.
 - 5.2.2. This committee will be tasked with identifying additional or new resources in the future if the need arises.

6. Funding Model

- 6.1. Tuition revenue generated by the institution offering the course will remain with that institution. For shared courses separate sections will be created at each institution, with the institution's students registering for its section, and so with tuition revenue going to the student's institution.
- 6.2. Students pursuing the completion of the degree at a main campus location will be assessed the on-campus rate approved by the SDBOR.

Students not enrolled in coursework at a main campus location will be assessed the established off-campus rate approved by the SDBOR.

Approved Course Rotation for Collaboratively-Delivered & On-Campus Courses

Physics Department Scheduling Articulation

Undergraduate Offerings

Fall 2017

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 341/343 (441/443)	Thermo/Stat Mech	USD (1)	Tu Th	10:00-12:00	2/2
Phys 451 (551)	Classical Mechanics	SDSM&T (1)	Tu Th	12:00-2:00	4
<i>Phys 481 (581)</i>	<i>Math Physics</i>	<i>SDSU (*1)</i>	Tu Th	2:00-4:00	4 (3)

Spring 2018

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 421 (521)	Electromagnetism	SDSU (1)	Tu Th	10:00-12:00	4
Phys 471 (571)	Quantum Mechanics	USD (1)	Tu Th	12:00-2:00	4
Phys 439 (539)	Solid State	SDSM&T (∞)	Tu Th	2:00-4:00	4

Courses in *Italics* are typically *NOT* taught every year. The numbers in parentheses indicate repetition. * means not a subject of rotation.
 Prepared by Yung Huh - SDSU August 27, 2017

Physics Department Scheduling Articulation

Undergraduate Offerings

Fall 2018

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 341/343 (441/443)	Thermo/Stat Mech	USD (2)	Tu Th	10:00-12:00	2/2
Phys 451 (551)	Classical Mechanics	SDSM&T (2)	Tu Th	12:00-2:00	4
Phys 361 (461)	Optics	SDSU (*1)	Tu Th	2:00-3:30	3

Spring 2019

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 421 (521)	Electromagnetism	SDSU (2)	Tu Th	10:00-12:00	4
Phys 471 (571)	Quantum Mechanics	USD (2)	Tu Th	12:00-2:00	4
Phys 439 (539)	Solid State	SDSM&T (∞)	Tu Th	2:00-4:00	4
Phys 433 (533)	Nuc & Particle Phys	USD (*1)	Tu Th	4:00-5:30	3

Fall 2019

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 341/343 (441/443)	Thermo/Stat Mech	USD (3)	Tu Th	10:00-12:00	2/2
Phys 451 (551)	Classical Mechanics	SDSM&T (3)	Tu Th	12:00-2:00	4
Phys 481 (581)	Math Physics	SDSU (2)	Tu Th	2:00-4:00	4 (3)

Spring 2020

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 421 (521)	Electromagnetism	SDSU (3)	Tu Th	10:00-12:00	4
Phys 471 (571)	Quantum Mechanics	USD (3)	Tu Th	12:00-2:00	4
Phys 439 (539)	Solid State	SDSM&T (∞)	Tu Th	2:00-4:00	4

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 Prepared by Yung Huh - SDSU August 27, 2017

Physics Department Scheduling Articulation

Undergraduate Offerings

Fall 2020

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 341/343 (441/443)	Thermo/Stat Mech	SDSM&T (1)	Tu Th	10:00-12:00	2/2
Phys 451 (551)	Classical Mechanics	SDSU (1)	Tu Th	12:00-2:00	4
Phys 361 (461)	Optics	USD (*1)	Tu Th	2:00-3:30	3

Spring 2021

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 421 (521)	Electromagnetism	SDSM&T (1)	Tu Th	10:00-12:00	4
Phys 471 (571)	Quantum Mechanics	SDSU (1)	Tu Th	12:00-2:00	4
Phys 439 (539)	Solid State	SDSM&T (∞)	Tu Th	2:00-4:00	4
Phys 433 (533)	<i>Nuc & Particle Phys</i>	USD (*2)	Tu Th	4:00-5:30	3

Fall 2021

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 341/343 (441/443)	Thermo/Stat Mech	SDSM&T (2)	Tu Th	10:00-12:00	2/2
Phys 451 (551)	Classical Mechanics	SDSU (2)	Tu Th	12:00-2:00	4
Phys 481 (581)	<i>Math Physics</i>	USD (*1)	Tu Th	2:00-4:00	4 (3)

Spring 2022

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 421 (521)	Electromagnetism	USD (1)	Tu Th	10:00-12:00	4
Phys 471 (571)	Quantum Mechanics	SDSU (2)	Tu Th	12:00-2:00	4
Phys 439 (539)	Solid State	SDSM&T (∞)	Tu Th	2:00-4:00	4

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Physics Department Scheduling Articulation

Undergraduate Offerings

Fall 2022

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 341/343 (441/443)	Thermo/Stat Mech	SDSM&T (3)	Tu Th	10:00-12:00	2/2
Phys 451 (551)	Classical Mechanics	SDSU (3)	Tu Th	12:00-2:00	4
Phys 361 (461)	Optics	USD (*2)	Tu Th	2:00-3:30	3

Spring 2023

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 421 (521)	Electromagnetism	USD (2)	Tu Th	10:00-12:00	4
Phys 471 (571)	Quantum Mechanics	SDSU (3)	Tu Th	12:00-2:00	4
Phys 439 (539)	Solid State	SDSM&T (∞)	Tu Th	2:00-4:00	4
Phys 433 (533)	<i>Nuc & Particle Phys</i>	SDSM&T (*1)	Tu Th	4:00-5:30	3

Fall 2023

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 341/343 (441/443)	Thermo/Stat Mech	SDSU (1)	Tu Th	10:00-12:00	2/2
Phys 451 (551)	Classical Mechanics	USD (1)	Tu Th	12:00-2:00	4
Phys 481 (581)	<i>Math Physics</i>	SDSM&T (*1)	Tu Th	2:00-4:00	4 (3)

Spring 2024

Course	Name	Originator	Days of Week	Time (CST/CDT)	Credit
Phys 421 (521)	Electromagnetism	SDSU (1)	Tu Th	10:00-12:00	4
Phys 471 (571)	Quantum Mechanics	USD (1)	Tu Th	12:00-2:00	4
Phys 439 (539)	Solid State	SDSM&T (∞)	Tu Th	2:00-4:00	4

*Courses in italics are typically NOT taught every year. The numbers in parentheses indicate repetition. * means not a subject of rotation.*
 Prepared by Yung Huh - SDSU August 27, 2017

Physics Department Scheduling Articulation

Undergraduate Offerings

Undergraduate Courses Typically DDN delivered

PHYS 341(441) — Thermodynamics (2c)
PHYS 343(443) — Statistical Physics (2c)
PHYS 361(461) — Optics (3c)
PHYS 421 (521)— Electromagnetism (4c)
PHYS 433 (533)— Nuclear and Elem Partl Physics (3c)
PHYS 439 (539)— Solid State Physics (4c)
PHYS 451 (551)— Classical Mechanics (4c)
PHYS 471 (571)— Quantum Mechanics (4c)
PHYS 481 (581)— Mathematical Physics (4c/3c)

(Green are typically taught every year)

(Black have historically been offered every other year)

Graduate Courses Typically DDN delivered

Phys 683 — Mathematical Methods II (3c)
Phys 721 — Electrodynamics I (3c)
Phys 723 — Electrodynamics II (3c)
Phys 739 — Condensed Matter Physics I (3c)
Phys 743 — Statistical Mechanics (3c)
Phys 749 — Condensed Matter Physics II (3c)
Phys 751 — Theoretical Mechanics (3c)
Phys 771 — Quantum Mechanics I (3c)
Phys 773 — Quantum Mechanics II (3c)
Phys 775 — Tensors and General Relativity (3c)
Phys 779 — Group Theory in Quantum Mechanics (3c)
Phys 781 — Nuclear and Particle Physics (3c)
Phys 783 — Quantum Field Theory (3c)
Phys 785 — Astrophysics and Cosmology (3c)
Phys 790 — Seminar (1c)

*Courses in italics are typically NOT taught every year. The numbers in parentheses indicate repetition. * means not a subject of rotation.*

Prepared by Yung Huh - SDSU

August 27, 2017