



SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

New Certificate

UNIVERSITY:	SDSU
TITLE OF PROPOSED CERTIFICATE:	Applied Physics
INTENDED DATE OF IMPLEMENTATION:	2022-2023 Academic Year
PROPOSED CIP CODE:	40.0801
UNIVERSITY DEPARTMENT:	Grad Study Physics
BANNER DEPARTMENT CODE:	SGPH
UNIVERSITY DIVISION:	Graduate School
BANNER DIVISION CODE:	3G

Please check this box to confirm that:

- The individual preparing this request has read [AAC Guideline 2.7](#), which pertains to new certificate requests, 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 proposal, that I believe it to be accurate, and that it has been evaluated and approved as provided by university policy.

Institutional Approval Signature

President or Chief Academic Officer of the University

Click here to enter a date
7-20-21

Date

1. Is this a graduate-level certificate or undergraduate-level certificate?

Undergraduate Certificate

Graduate Certificate

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

South Dakota State University (SDSU) requests authorization to offer a graduate certificate in Applied Physics. The proposed Applied Physics Certificate will provide knowledge and practical experience for students to have an advanced experience with health physics, nuclear physics, or condensed matter physics. Individuals who complete this certificate will be well prepared to advance in their career paths in applied areas of physics, including laboratory management. Additional electives are available for those that wish to pursue this field further.

The graduate certificate is designed to be either a stand-alone, value-added, or stacked credential. The certificate stacks to the M.S. in Professional Science, one of seven proposed certificates that would stack to that degree.

SDSU does not request new state resources for the proposed certificate. The program will leverage collaborative opportunities with the South Dakota School of Mines and Technology (SDSMT) and the University of South Dakota (USD). Students will be able to complete coursework via distance learning using the Dakota Digital Network (DDN).

3. If you do not have a major in this field, explain how the proposed certificate relates to your university mission and strategic plan, and to the current Board of Regents Strategic Plan 2014-2020.

SDSU is currently authorized to deliver a B.S in Physics.

The Applied Physics Certificate supports the mission of SDSU as provided in SDCL 13-58-1: *Designated as South Dakota's land grant university, South Dakota State University, formerly the state college of agriculture and mechanical arts, shall be under the control of the Board of Regents and shall provide undergraduate and graduate programs of instruction in the liberal arts and sciences and professional education in agriculture, education, engineering, home economics, nursing and pharmacy, and other courses or programs as the Board of Regents may determine.*

The proposed certificate also supports the goals stated in the South Dakota Board of Regents Strategic Plan 2014-2020:

Goal 1 – Student Success

- Increase total graduate degrees awarded.

Goal 2 – Academic Quality and Performance

- Continue to approve new graduate programs.
- Grow the number of students participating in experiential learning.
- Develop and grow high-quality and distinct academic programs to meet the needs of diverse students and market demands.

Goal 3 – Research and Economic Development

- Increase the number of graduates from STEM programs.

In addition, this graduate certificate aligns with the SDSU's Imagine 2023 strategic plan¹ by offering a student-centered education. Specifically, the courses and certificate will contribute to the attainment of *Strategic Goal 1 – Excellence through Transformative Education*. This will be a distinct and high-quality academic program designed to meet student and market demand.

4. Provide a justification for the certificate program, including the potential benefits to students and potential workforce demand for those who graduate with the credential.

The graduate certificate is designed to be either a stand-alone, value-added, or stacked credential. The certificate stacks to the M.S. in Professional Science, one of seven proposed certificates that would stack to that degree. Many prospective students who would be attracted to this program would already be employed and benefit their career trajectories by obtaining this type of education. Given the trends and the central nature of physics to science and engineering, individuals with the type of training provided by this certificate program will be in high demand.

¹ <https://www.sdstate.edu/imagine-2023-aspire-discover-achieve>

According to the Bureau of Labor Statistics, physics shows a 7% growth rate, faster than average, with a median salary of \$122,220.² A report from the American Physical Society³ tracking nearly 1000 M.S. Physics recipients one year after their degree (from 2016-2018), found that for U.S. citizens, 57% were employed or continuing their prior employment, 33% were pursuing continued graduate education, and 7% were unemployed. Of those employed, 57% were in the private sector (with a median starting salary of \$70,000), 20% were at 2- or 4-year colleges and universities, 8% in high schools, 8% in civilian government/national laboratories, and 7% in active military. Of those in the private sector, 28% were in physics and astronomy, 26% in engineering, 15% in computer science, 14% in education, 11% in other STEM fields, and 6% in non-STEM fields.

5. Who is the intended audience for the certificate program (including but not limited to the majors/degree programs from which students are expected)?

The University anticipates students enrolling to be undergraduates continuing onto a graduate degree and those already employed (new or returning to the university). The graduate certificate is designed to be either a stand-alone, value-added, or stacked credential. The certificate stacks to the M.S. in Professional Science, one of seven proposed certificates that would stack to that program. Students with a bachelor's degree, but with work experience in the field will particularly benefit from this certificate. In addition, the certificate will benefit students in mechanical engineering, electrical engineering, and chemistry.

6. Certificate Design

A. Is the certificate designed as a stand-alone education credential option for students not seeking additional credentials (i.e., a bachelor's or master's degree)? If so, what areas of high workforce demand or specialized body of knowledge will be addressed through this certificate?

Yes. Students may pursue the certificate as a stand-alone credential. As a stand-alone program the certificate will provide training in key elements for success in (Materials Physics track) areas of physics related to chemistry, materials science, engineering, nanotechnology, atomic physics, or biophysics or (Nuclear Physics track) in the regulatory and management aspects of ionizing radiation.

B. Is the certificate a value-added credential that supplements a student's major field of study? If so, list the majors/programs from which students would most benefit from adding the certificate.

Yes. The certificate is intended to supplement a SDSU graduate education. The disciplines most likely to benefit would be mechanical engineering, electrical engineering, and chemistry.

C. Is the certificate a stackable credential with credits that apply to a higher-level credential (i.e., associate, bachelor's, or master's degree)? If so, indicate the

² Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Physicists and Astronomers, at <https://www.bls.gov/ooh/life-physical-and-social-science/physicists-and-astronomers.htm> (visited June 28, 2021).

³ <https://www.aps.org/careers/statistics/index.cfm>

program(s) to which the certificate stacks and the number of credits from the certificate that can be applied to the program.

Yes. The Applied Physics Certificate has been designed as a stackable credential that the credits will apply towards the Professional Science (M.S.).

7. List the courses required for completion of the certificate in the table below (if any new courses are proposed for the certificate, please attach the new course requests to this form).

Materials (Condensed Matter) Physics Track

Prefix	Number	Course Title	Prerequisites for Course	Credit Hours	New (yes, no)
PHYS	521	Electromagnetism	None	4	No
PHYS	539	Condensed Matter Physics	None	4	No
PHYS	581	Mathematical Physics I	None	4	No
Subtotal				12	

Nuclear/Health Physics Track

Prefix	Number	Course Title	Prerequisites for Course	Credit Hours	New (yes, no)
PHYS	533	Nuclear and Elementary Particle Physics	None	3	No
PHYS	537	Foundations of Health Physics	None	3	No
NE	535	Introduction to Nuclear Engineering	None	3	No
		PHYS Elective	None	3	No
Subtotal				12	

8. Student Outcome and Demonstration of Individual Achievement.

Board Policy 2:23 requires certificate programs to “have specifically defined student learning outcomes.

A. What specific knowledge and competencies, including technology competencies, will all students demonstrate before graduation?

Students will be able to:

- Understand the fundamental theory of condensed matter physics or nuclear physics.
- Become proficient in the use of mathematical tools used to describe condensed matter systems (Materials Physics Track) and effectively communicate this information.
- Become proficient in the disciplinary tools of nuclear engineering, especially as applied to biological systems (Nuclear Physics Track), and effectively communicate this information.
- Apply and interpret fundamental physics principles and techniques.
- Demonstrate the ability to work independently and as a part of a team.

B. Complete the table below to list specific learning outcomes – knowledge and competencies – for courses in the proposed program in each row.

Individual Student Outcomes	Program Courses that Address the Outcomes					
	PHYS 521	PHYS 539	PHYS 581	PHYS 533	PHYS 337	PHYS 535
Understand the fundamental theory of condensed matter physics or nuclear physics.	X	X	X	X	X	X
Become proficient in the use of mathematical tools used to describe condensed matter systems (Materials Physics Track) and effectively communicate this information.	X	X	X			
Become proficient in the disciplinary tools of nuclear engineering, especially as applied to biological systems (Nuclear Physics Track), and effectively communicate this information.				X	X	X
Apply and interpret fundamental physics principles and techniques.	X		X	X	X	
Demonstrate the ability to work independently and as a part of a team.	X	X	X	X	X	X

9. Delivery Location.

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

A. Complete the following charts to indicate if the university seeks 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 online program)?

	Yes/No	Intended Start Date
On campus	Yes	2022-2023 Academic Year

	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	015 - Internet Asynchronous– Term Based Instruction 018 - Internet Synchronous 030 – Blended/Hybrid	2022-2023 Academic Year
Does another BOR institution already have authorization to offer the program online?	No	If yes, identify institutions:	

B. Complete the following chart to indicate if the university seeks authorization to deliver more than 50% but less than 100% of the certificate through distance learning (e.g., as an online program)? *This question responds to HLC definitions for distance delivery.*

	Yes/No	<i>If Yes, identify delivery methods</i>	<i>Intended Start Date</i>
Distance Delivery (online/other distance delivery methods)	No		