

SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

Intent to Plan for a New Program

UNIVERSITY:	SDSU
DEGREE(S) AND TITLE OF PROGRAM:	Master of Science in Applied Physics
INTENDED DATE OF IMPLEMENTATION:	2018-2019 Academic Year

University Approval

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

President of the University

2/9/2018

Date

1. What is the general nature/purpose of the proposed program?

South Dakota State University (SDSU) requests authorization to plan a Master of Science in Applied Physics. Applied physics is intended for a particular technological or practical use. usually considered as a bridge between physics and engineering. Applied physics 70-1 credit is ic2Dr

The University does not request new state resources.

2. What is the need for the proposed program (e.g., Regental system need, institutional need, workforce need, etc.)? What is the expected demand for graduates nationally and in South Dakota (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.)?

Driving innovation and breaking through disciplinary silos will require an enhanced understanding of physics at many levels, from the physical to the quantum and the nuclear. Applied physics is inherently multidisciplinary, facilitating such industries as energy production, aerospace engineering, nuclear medicine and pharmaceuticals, biophysics, environmental management, and materials science.

The U.S. Bureau of Labor and Statistics does not report statistics for Applied Physicists. However, it does report the overall employment of physicists and astronomers, which is projected to grow by 14 percent from 2016 to 2026. This is twice as fast as all other occupations combined, with about 2,800 new jobs over that period nationally. By comparison, the growth of architecture and engineering jobs are expected to grow by 7% over the same period, with 193,200 new jobs.²

Applied Physics graduates find work in other fields besides a physics-related area or in engineering. Biochemists and Biophysicists are projected to grow 11%.³ Computational skills learned from applied physics research often lead to employment as a computer research scientist, which is expected to grow by 19%.⁴ Applied mathematical skills would support financial analysis and banking services which will grow by 11%.⁵ Materials scientist positions are expected to keep pace with the national average, growing by 7%.⁶ Although nuclear engineers in power, medical, and industrial applications are expected to grow by only 4%, much of the nuclear workforce will be retiring.⁷ The number of available jobs will exceed the number of new jobs.

In 2015, physicists that worked in hospitals averaged an annual salary of \$162,870, physicists in areas of scientific research averaged \$163,820, and those that worked in the federal, state, and local government averaged \$111,510. The national average salary in all architecture and engineering categories given average weekly wages in May 2016 was \$84,302, and the average annual salary

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for the Sioux Falls area with a median wage of \$68,494⁹. Thus, the M.S. in Applied Physics aims to facilitate employment in high need areas that pay more, or similarly, provide the workforce for industries that would pay high wage jobs.

SDSU has received letters of support from Avera Cancer Institute, Sanford Underground Research Facility, and Northern Plains Power Technologies. They are all based in South Dakota: Avera is in Sioux Falls, Sanford near Rapid City, and Northern Plains near Brookings. Their letters positively support the proposed Applied Physics program, and expect the program to provide occupations in the following areas.

- x Radiation therapy, medical imaging, chemotherapy, and drug delivery (Avera);
- x Engineers for physics experiments, support of commercialization efforts, and development of new experiments that can/must be done at Homestake (Sanford Underground);
- x Engineering service on distributed generation plant, energy storage and their interconnects, and low inertia power system (Northern Plains Power).

3. How would the proposed program benefit students?

The program will prepare students to enter the workforce directly as valued technical experts that

2014-2020.

Goal 1: Student Success

- x Grow the number of undergraduate and graduate

government.

7. Are students enrolling in this program expected to be new to the university or redirected from other existing programs at the university?

Yes, students enrolling in the M.S. in Applied Physics program are expected to be new to the university. Enrollment in other graduate programs will be affected.

8. What are the university's expectations/estimates for enrollment in the program through the first five years? What are the university's expectations/estimates for the annual number of graduates from the program after the first five years? Provide an explanation of the methodology/the university used in developing these estimates.

The program will grow in total enrollment from 2 in the first year to 10 by the fifth year. The enrollment limitations are based on space, instrumentation, faculty availability, research grant funding, and available graduate teaching assistant (TA) positions in the D (g)-14.2 (pa)4 (r)3 (t)-2 (m)-12 (e)4

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9. Complete the following to indicate if the university intends to seek authorization to deliver the entire program on campus, at any off-campus location (e.g., Sioux Falls, Capital University Center, Black State University - Rapid City, etc.) or deliver the entire program through distance technology (e.g., as an online program)?¹⁶

	Y /No	Intnded SttD
0	Y	2018-2019 Academic Year



¹⁶ The High Learning Commission (HLC) Board of Review requires a survey for sites of programs on-campus and distance delivery.

¹⁷ Delivery methods are defined in AA Guideline 5.

Undergraduate courses for the B.S. in Physics will continue to be shared among SDSU, USD, and SDSM&T, the graduate courses for the M.S. in Applied Physics will be delivered independently at SDSU. Most of the graduate courses are already approved, and the Department of Physics at SDSU is authorized to offer those courses independently.

10. What are the university's plans for obtaining the resources needed to implement the program?

Graduate Research Assistants will be supported on graduate assistantships and other external funds. The external funding sites include NSF, NASA, NIH, to name a few. The graduate program would be supported by applying the same PHYS program fees applied to the B.S. in Physics.

Development/
Startup Long-

Appendix A

Curriculum Example: Master of Science in Applied Physics, the New Jersey Institute of Technology

The program is for students with an undergraduate degree in physics, applied physics or engineering who wish to apply physics to optical science, microelectronics, device physics, materials science, surface science, laser physics, solar phenomena, and other related areas.

Admission Requirements

A bachelor's degree in physics, applied physics, or related areas from an accredited institution is required. An undergraduate GPA above 3.0 is required. Students must submit GRE (general test) scores. In addition, applicants are required to provide letters of recommendation from their previous academic institutions. Students for whom English is not their native language are required to have

Appendix B

- x Letter of Support from Avera Cancer Institute, Sioux Falls, SD

x Letter of Support from Sanford Underground Research Facility, Lead, SD

- x Letter of Support from Northern Plains Power Technology, Brookings, SD