

Contact: Rachel Boon

**REQUEST FOR NEW PROGRAM AT THE UNIVERSITY OF NORTHERN IOWA:  
BACHELOR OF ARTS IN PHYSICS**

**Action Requested:** Consider approval of the request by the University of Northern Iowa to establish a Bachelor of Arts in Physics in the Department of Physics of the College of Humanities, Arts & Sciences.

**Executive Summary:** The Bachelor of Arts (BA) in Physics expands options for UNI students to gain STEM related training and expand opportunities for interdisciplinary learning that will benefit students in their future careers without extending time-to-degree. This complements the existing Bachelor of Science in Physics and will be supported by the same faculty teaching in that degree program. The proposed program addresses the Board of Regents Strategic Plan objective 1.1; “The Regent institutions provide clear pathways for students to enter, move through and complete their education and career goals.”

**Background:**

◇ Description of proposed program.

The BA Physics Major is suitable for a student seeking a background in Physics that involves physical, mathematical and computational problem solving. The Physics BA degree is structured so that students can comfortably pursue it as a secondary major, thereby enhancing and complementing the education and training they receive in their primary major. It is especially appropriate for students with interdisciplinary interests who intend to pursue a career in, for example, computer science, medicine, business, or law. The BA major provides an opportunity to take courses in other science areas of interest.

◇ Academic objectives.

The academic objectives include: knowledge of introductory calculus-based classical mechanics, classical electrodynamics, relativity and quantum mechanics; knowledge of mathematics through Calculus II; simulation of physical systems through computer programming; scientific report writing; additional science knowledge through electives.

◇ Need for proposed program.

Currently, the most important objective of the Physics Department is to grow enrollment in its major programs. This was a major goal in the most recent Academic Program Review (2010). The Physics BA will assist in recruiting and retaining students for whom the Physics BS major does not meet their needs for flexibility with a second major. The overwhelming majority of Physics BS majors declare their major as freshmen or immediately upon transferring to UNI. Relatively few students switch their major to the Physics BS having been at UNI for a semester or more. With the proposed Physics BA requirements, interested students can switch to the Physics BA major as a sophomore and still be able to complete the degree within 4 years of matriculation to UNI. Additionally and more importantly, students in primary majors such as computer science, chemistry, biology, and earth science can choose the proposed Physics BA as a second major without lengthening their time to degree, while also increasing their professional marketability by expanding their interdisciplinary scientific knowledge base and reasoning skills.

◇ Link to institutional strategic plan.

The mission of UNI is to provide learning experiences that inspires students to embrace challenge, innovation and critical thought. The strategic plans of UNI and the College of Humanities, Arts and Sciences both emphasize the need for discipline-specific and interdisciplinary opportunities that promote critical thought and creativity. The proposed BA degree in Physics is consistent with these goals and objectives. Physics is a challenging discipline that involves physical, mathematical and computational problem solving. The degree program has been structured so that motivated students can comfortably pursue it as a second major, thereby enhancing and complementing the education and training they receive in their primary major. Given the rapid advancement of technology in all areas of the American economy, the problem-solving and quantitative skills that an education in Physics provides would better prepare UNI graduates for well remunerated employment in the many areas of the private sector that demand technical skill and quantitative problem solving. Encouraging students to pursue these educational opportunities is the duty of a relevant and effective institution of higher education.

◇ Relationship to existing programs at UNI.

As mentioned previously, the proposed program will make it feasible for majors in other sciences to pursue a second major in Physics and, hence, benefit from the unique problem-solving skills that an education in Physics develops. Opportunities for interdisciplinary projects with departments such as Computer Science, Chemistry & Biochemistry, Geography, and Biology could be pursued, which would be advantageous for the students. By offering of the proposed BA in Physics, the only non-teaching BA degree option from the Physics department, we could improve overall graduation rates for Physics programs. The proposed BA program will not duplicate any existing program at UNI.

◇ Relationship to existing programs at other colleges and universities.

The Regent universities and private universities and colleges all offer bachelor's degrees in Physics. Physics departments at small colleges tend to offer a single bachelor's degree in Physics, whereas larger departments may offer two or more flavors, typically one or two BS degrees and a BA degree. The different degree types accommodate the varying career goals of students who possess a wider spectrum of preparedness for university Physics. Currently, UNI offers a BS degree and a BA Physics Teaching degree. Because of the relatively large number of credits (59) required for the BS, there are few double majors. The BA degree will make it more feasible for students to pursue Physics as a second major, leading to a greater level of interdisciplinary exchange. The Physics Department goal is to become a leader in Iowa and beyond in establishing interdisciplinary linkages of Physics with other sciences.

◇ Unique features.

We hope to improve recruitment yields and graduation-rate outcomes with the re-introduction of the BA program in Physics. This is especially important to the UNI Physics Department because it has no graduate program. The health of the department depends on sustained, successful recruitment and retention of undergraduate Physics majors. In addition, the UNI Physics Department has a tradition of offering students research opportunities with a professor. The proposed BA students would also have the opportunity to learn research skills, which are valuable for careers in industry.

◇ Resources.

No additional facilities, faculty or equipment will be needed. The requirements of the proposed BA in Physics are a subset of the existing BS in Physics program. If the program succeeds in increasing enrollments in the first-year Physics courses such that a second section is necessary, an adjunct may be needed to relieve the instructor from another course.

◇ Student demand.

STEM education and the preparation of students for STEM-related jobs are important to the State of Iowa. Physics is unique in that it encompasses all areas of STEM in one subject. The proposed program is a mechanism to attract double majors and to retain students already in the Physics program. Like the one at UNI, the great majority of Physics programs across the U.S. are smaller in size. There is room to grow and the proposed BA will assist in that growth. Relatively small increases in Physics-trained graduates have the potential to result in disproportionately large contributions to the Iowa and national economies because of the multiple competencies of physicists.

◇ Duplication.

All public and private universities and most 4-year liberal arts colleges offer bachelor's degree programs in Physics. (Mount Mercy University and Upper Iowa University do not have a Physics major.) The structure of the degree program varies with the institution. The University of Iowa has multiple bachelor's degrees in Physics, Iowa State University has a bachelor's program (BS) as well as "Physics+" programs in combination with other sciences or engineering, and liberal arts colleges tend to have one bachelor's degree program.

◇ Workforce need/demand.

As previously indicated, STEM education and the ability of Iowa students to fill high-paying and technologically important STEM jobs is of great strategic importance to the State of Iowa and to the federal government of United States. According to the U.S. Department of Labor Bureau of Labor Statistics Job Outlook 2014-2024, "Graduates with any academic degree in Physics or Astronomy, from a bachelor's degree to a doctorate, will find their knowledge of science and mathematics useful for entry into many other occupations. Database management skills also are beneficial, because of the large datasets these professionals work with." The predicted growth in employment for physicists is 7% over the next 10 years.

◇ Consultation with representatives of other programs.

Iowa State University and the University of Iowa have been informed of UNI's intent to re-establish the BA program in Physics. They have no objections. This program is being proposed for recruitment (via increasing the number of double majors) and retention within UNI's Physics Department. It will have negligible effect on programs at other institutions.

◇ Letters of support.

Letters are provided from both Iowa State University and the University of Iowa.

◇ Cost.

	TOTAL COSTS*	TOTAL NEW COSTS*
Year 1	0	0
Year 2	0	0
Year 3	0	0
Year 4	\$ 12,760	\$12,760
Year 5	\$ 25,520	\$12,760
Year 6	\$ 38,280	\$12,760
Year 7	\$ 51,040	\$12,760

\* Costs indicated are incremental in nature as it includes the cost for hiring an adjunct instructor to cover the cost of instruction if needed each year. This may not be needed each year, thus it is an estimate. However, it is also possible the department will be able to hire for a tenure-track faculty position because of a position recently lost due to retirement. In this case, the courses could be covered without adjunct costs.

◇ Projected enrollment.

Undergraduate

Undergraduate	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Majors	2	3	5	7	7	7	7
Non-Majors	2	3	5	6	6	6	6

(We take “non-majors” to mean second majors here.)

Graduate

Graduate	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Majors	0	0	0	0	0	0	0
Non-Majors	0	0	0	0	0	0	0

◇ Anticipated sources of students.

Some current Physics students may switch from the BS Physics program to the BA Physics; others will switch from other programs. The remaining students will be second majors (originally non-majors) attracted to the opportunity to double major with Physics as their second major.

◇ Articulation agreement.

There are currently articulation agreements in place for introductory courses in the major.

◇ Off-campus delivery.

This program will be delivered face-to-face on UNI’s campus.

◇ Accreditation.

Programmatic accreditation is not necessary.

◇ Opportunities for internships.

Internships are not a requirement in the program.

◇ Marketing plan.

In an effort to publicize a second major option, the Physics Department has already had extensive discussions with the Biology Department Head regarding (i) informing and advising biology majors about the Physics BA. (ii) A significant number of Chemistry/Biochemistry majors enroll in Physics I for Science & Engineering. The Physics BA will be heavily marketed to this cohort. (iii) Brochures will be sent directly to majors in Biology, Chemistry & Biochemistry, Computer Science, Math and Earth Science. (iv) Use the Physics BA as a basis for a “Big Data” concentration, along with the Statistics program in the Math Department.

◇ Evaluation plan.

Physics enrollments across the nation are relatively small so if this program results in the addition of 15-20 majors over the course of 7 years it would be considered a great success.

In terms of outcomes assessment, the program evaluation is a robust plan.

(1) A significant objective of this program is to improve interdisciplinary connections between physics and other sciences. The department will quantify interdisciplinary engagement by the number of students with physics as a second major. A metric for this is one-fourth of the students enrolled in the BA Physics program should be double majors.

(2) Assessment of physics knowledge is routinely conducted during the first year using the AP Physics C tests. The department will begin to assess Modern Physics knowledge (the most advanced theoretical course required in the BA Physics degree program) in spring 2017 using an externally developed assessment instrument. Results from these assessments will inform course revisions to enhance learning of key concepts and problem-solving skills.

(3) Post-graduation pursuits for BA Physics graduates will be tracked (as they currently are for all degree programs). The number of students gaining employment or pursuing advanced degrees will be recorded annually. Salary information will also be requested and collected. The social network LinkedIn will be used to gather longitudinal data.

◇ Date of implementation.

Creation of the proposed program will become effective upon approval by the Board of Regents and will be included in the University’s General Catalog. The anticipated implementation date is August 2017.

LETTERS OF SUPPORT



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June 6, 2016

Professor Paul M. Shand  
Interim Head  
Physics Department  
University of Northern Iowa  
Cedar Falls, IA 50614

Re: B.A. degree in Physics at UNI

Dear Paul,

Thank you for your letter. I just returned from a short APS conference for physics department chairs, and especially given what I heard there I think that re-introducing the BA degree in Physics has the potential to be valuable to the students at UNI and to your department. The extra flexibility allows you to better prepare students for the wide spectrum of career paths (that physics graduates are doing successfully) that do not involve graduate school in physics. I did not realize that you may need my support to make this change, but in any case you do have my support.

Best Regards,

Fred Skiff, Ph.D.  
Chair  
Department of Physics and Astronomy  
University of Iowa

**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

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June 27, 2016

Paul M Shand, Interim Head  
Physics Department  
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Dear Professor Shand,

Thank you for reaching out to our Physics Department chair requesting our input on your proposal to re-introduce the B.A. degree in physics at the University of Northern Iowa. I am happy to respond to your request on behalf of the Department and the College of Liberal Arts and Sciences.

Your letter indicates your hope that the more flexible B.A. program in Physics will attract more interest in completing Physics as a second major. We all understand the potential benefit to students of adding Physics as a second major and have no objection to UNI's effort to revive its B.A. degree program with this goal in mind. It may be useful to know that Iowa State offers only the B. S. degree in Physics and has just over 100 undergraduate Physics majors (97 first majors, 10 second majors, Fall 2015).

The Department and College of Liberal Arts and Sciences appreciate the opportunity to know more about the Physics program at UNI. It is always good to keep open the lines of communication across the Regents Institutions. If I can be of further assistance, please let me know.

Sincerely,



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