

**F - New or Revised Minor/Emphasis/Area of Concentration : Entry # 2339****Today's Date**

09/12/2022

**Your Name**

Briana Fiser

**Your Email**[bfiser@highpoint.edu](mailto:bfiser@highpoint.edu)**Please select the appropriate school overseeing this proposal:**

Natural Sciences

**Is this proposal connected to any other proposals currently being submitted? If so, please describe below.**

No.

**Is this submission in response to a "revise and resubmit" decision on a previous proposal?**

No

**Category of proposal**

Minor

**Is this new or a revision?**

New

**200 Word Summary of Proposal**

The Department of Physics proposes the creation of a new minor called Applied Physics. The goals of this minor are to open the study of physics to students who are interested specifically in its application to other disciplines, and to increase the participation of students from majors outside of the STEM fields that require higher level mathematics courses. We have multiple physics courses that focus on the applied, experimental or computational side of physics, and the Applied Physics minor provides students a pathway through those courses.

The current Physics minor requires calculus 1 and 2, calculus-based physics 1 and 2, 2000-level modern physics, and an additional 2000-level or higher PHY course. Our proposed Applied Physics minor (24 credits) will require algebra-based physics 1 and 2 or calculus-based physics 1 and 2, and three additional courses, two of which must be PHY courses at the 2000 level. Because no student can complete this minor without calculus 1, it must be added to the list of required courses, making the total number of credits 24.

For one of the three courses, options include 1000-level "Physics of Sound and Music" and "Astronomy". We believe these additional course options for the minor will open the study of physics up to a much greater number of students across a greater diversity of majors.

**Rationale for Proposed Curriculum**

The Department of Physics currently offers a B.S. or B.A. in Physics and a minor in Physics. The minor in Physics requires MTH 1410 or 1415 (calculus 1) and MTH 1420 or 1425 (calculus 2), and the 3-year average for this minor has been 8 students across

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the freshman-senior years. (Note the physics minor does not include any classes specific only to the minor.) These students have typically been majors in biochemistry, computer science, and mathematics. Our rationale for proposing the Applied Physics minor is to provide students who do not take both calculus 1 and 2 an opportunity to explore the application-based, experimental, and computational side of physics. By doing so, we hope to increase the diversity of majors who explore physics more deeply than a one-semester natural sciences general education requirement and make the study of physics more accessible to all.

This proposed minor is 24 credits and requires either algebra-based physics 1 and 2 (PHY 1510/1511, PHY 1520/1521) or calculus-based physics 1 and 2 (PHY 2010, PHY 2020). The PHY 1510/1520 sequence has a prerequisite of pre-calculus (MTH 1400), and the PHY 2010/2020 sequence requires calculus 1 and 2 (MTH 1410/1514, 1420/1425). The student could also mix and match to fulfill the minor, which we have had students do (taking PHY 2010 and PHY 1520/1521). In addition, the minor requires three courses, one of which could be another 1000-level PHY course that applies physics to other areas such as Astronomy, the Physics of Sound and Music, or the Physics of Video Games. The other two courses must be at the 2000-level. While the majority of the 2000-level courses require additional prerequisites (such as CSC 1710 or MTH 1410), we believe the increase in course options to fulfill the Applied Physics minor, as compared to the Physics minor, will increase participation in the study of physics.

Multiple majors require pre-calculus, business calculus, or calculus 1, and our current Physics minor may limit their participation in physics because of its calculus 2 requirement. One example is the B.S. Biology major. Biology majors take algebra-based physics 1 and 2 and calculus 1 for their degree and often as prerequisites for medical school, but are not currently eligible with that physics sequence to minor in physics. The new Applied Physics minor would provide them with a pathway to do so, and data published by the American Institute of Physics in April 2022 has shown that studying physics is beneficial for students taking the Medical College Admissions Test (MCAT), as physics majors score the 5th highest on the MCAT. Each year we teach approximately 60 students in PHY 1510/1520, about half of which are biology majors and half of which are exercise science majors.

All of the course options to fulfill the Applied Physics minor are already currently offered and thus no new courses would need to be created. However, we will seek to create courses at the 2000 level with minimal prerequisites to support both this minor and the new general education curriculum.

Lastly, there is precedent at other institutions for physics minors that are application-based or that allow algebra-based physics to fulfill requirements. Our Applied Physics curriculum is patterned after Davidson College's Applied Physics minor which requires calculus-based physics 1, algebra or calculus-based physics 2, a physics of music or environmental design course, a course in computational physics, and an electronics course. Additionally, Appalachian State University's physics minor requires the algebra-based or calculus-based physics sequence in addition to two 2000-level courses.

### **What Program(s), Degree(s), and/or Major(s) is this proposal intended to complement?**

Our current Physics minor has had a 3-year average of eight minors across the freshman-senior years. These students have typically majored in biochemistry, chemistry, computer science, and mathematics. The math requirements of Calculus 1 and 2 have tended to limit the minor to STEM majors that take these mathematics courses. As our proposed Applied Physics minor includes physics course options that are less focused on theoretical physics and more focused on experimental and computational physics, we anticipate this minor will appeal to a broader population of students across a greater diversity of majors. Over the last three years, roughly 3-5 students per year have made inquiries about the possibility of minoring in Physics and replacing the Modern Physics requirement with a course that more directly applies physics to their areas of study or interest. This Applied Physics minor will provide those students with such an opportunity.

### **What Academic Divisions, University Officers, Programs, or other stakeholders are involved in, or affected by, this addition or change?**

This minor will allow CHM 3111 to satisfy four credits of the minor. The inclusion of CHM 3111 may result in a slight increase in the number of chemistry majors who choose CHM 3111 as their upper-level elective. The Department of Chemistry Chair, Dr. Todd Knippenburg, approves the inclusion of CHM 3111 in the Applied Physics minor. No other stakeholders or programs are involved in this minor addition.

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Please attach documentation showing support from key stakeholders, if any.

- [Signature-page-Chemistry.pdf](#)

### Is this proposed curriculum consistent with the University and School Mission?

The level of academic quality and rigor match University/School standards and the minor is consistent with the mission of our University and School. We are employing existing courses within the Physics Department to count toward the minor, and the minor will provide students with a pathway through physics that focuses more on applications of physics, which fulfills a University goal of providing students with experiential learning opportunities. These courses currently employ "best practices for fostering in students the skills, attitudes and behaviors of a scientist," which is part of the Wanek School of Natural Sciences' commitment to students. The minor incorporates scientific inquiry throughout and provides students with the opportunity, through group and laboratory work, to practice and gain the skills necessary to work with others in a diverse world. In addition, it will foster in students knowledge of the natural world, talent in the areas of critical thinking and problem solving, and habits of mind such as persistence and curiosity to help them further their own growth in their understanding of the natural world and eventually make significant societal contributions. Thus, in these ways, the minor in Applied Physics supports the missions of the University and Wanek School of Natural Sciences.

This minor curriculum is based on Davidson College's Applied Physics Minor which comprises five courses that include calculus-based introductory physics 1, algebra or calculus-based physics 2, a 100-level physics course called "Music: Sound with Impact" or a 200-level course called "Energy, the Environment, and Engineering Design," a 200-level course "Computational Physics," and a 300-level "Electronics and Instrumentation". While Davidson requires the calculus-based physics 1 course, we would like to open physics up to a broader student population at High Point. Allowing algebra-based physics 1 and 2 would provide at least 64 more students per year with an entry point into the Applied Physics Minor. Additionally, other institutions in our area allow algebra-based or calculus-based physics to count toward their minors in physics. Appalachian State University's physics minor requires the algebra-based or calculus-based physics sequence in addition to two 2000-level courses. UNC Greensboro's physics minor requires the algebra-based or calculus-based physics sequence in addition to seven credits.

**Does this proposal require an interim or transition plan, or can it be implemented immediately? If a transition plan is required, describe this or attach at the end of the proposal.**

No interim or transition plan is required. It can be implemented immediately. No additional resources are required for this minor.

### Assessment Strategy

The effectiveness of this minor will be assessed similarly to the current minor and majors in physics - through a combination of national standardized assessments given in the introductory physics course sequence, and final exams and projects in courses beyond the introductory sequence. Physics has no accrediting body, and thus there are no accreditation guidelines.

**Please attach department approval page and any other supporting documents. If this proposal requires additional resources beyond normal operating expenses of department, school, or University, attach Provost's Provisional Willingness to Consider.**

- [Applied-Physics-Minor-Signed-Provost-Consideration.pdf](#)
- [signature-page-Fiser.pdf](#)
- [2022-12-15-Applied-Physics-Minor-Fall2022.pdf](#)

### For Deans:

**Does this proposal connect solely to programs in one school (Intra-Collegiate), or does it have connections to broader university programs and requirements (Inter-Collegiate)? Note that all proposals connected to University Academic Programs**

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Inter-collegiate

**Is this proposal consistent with the school and university mission?**

Yes

**Comments justifying this determination?**

This proposal leverages the existing courses in physics and also greatly expands the students who would potentially be interested in pursuing this minor. It will not require any additional resources, and should be of interest to a cadre of students who are currently pre-professional health but not a biochemistry major who might be interested in further pursuing physics training.

**Are necessary resources available to support this proposal?**

Yes

**[DEAN] I approve/deny this proposal for further advancement**

Approve

**Today's Date (REQUIRED)**

09/22/2022

**For the School Curriculum Committee Chair****Is this proposal consistent with the mission and requirements of your school?**

Yes

**Does this proposal reflect a course that is rigorous, current, and reflects best practices and highest academic standards?**

Yes

**Comments justifying this determination?**

Physics proposal for a new minor was discussed briefly and members expressed support for an Applied Physics minor that did not require Calculus 2. Dr. Fogarty, professor of CHM-3111, informed and confirmed to the committee the pertinence of the advanced topics course within the physics framework. The committee unanimously voted to approve the proposal, as-is.

**[SCHOOL COMMITTEE] This committee approves/denies advancement of this proposal**

Approve

**Today's Date (REQUIRED)**

10/06/2022

**For APIRC:****Is this proposal consistent with the history and mission of the university?**

Yes

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Yes

**[APIRC] This committee approves/denies advancement of this proposal**

Approve

**Today's Date (REQUIRED)**

12/02/2022