UNIVERSITY *of* WASHINGTON

Michael K. Young
President

March 10, 2014

Dean Elaine Scott
School of Science, Technology, Engineering and Mathematics
University of Washington, Bothell
Box 358538

Dear Elaine:

Based upon the recommendations of the Executive Council, the General Faculty Organization has recommended approval of a minor in Physics. A copy of the approval is attached.

I am writing to inform you that the School of Science, Technology, Engineering, and Mathematics is authorized to specify these requirements beginning autumn quarter 2014.

The new requirements should be incorporated in printed statements and in individual department websites as soon as possible. The *General Catalog* website will be updated accordingly by the Registrar's Office.

Sincerely yours,

Michael K. Young
President

Enclosure

cc: Dr. Dan Jaffe (with enclosure)
Mr. Robert Corbett (with enclosure)
Ms. Virjean Edwards (with enclosure)

301 Gerberding Hall • Box 351230 • Seattle, Washington 98195-1230 • 206.543.5010 • Fax 206.616.1784 • president@uw.edu

NOV 1 2 2013

UNIVERSITY OF WASHINGTON

CREATING AND CHANGING UNDERGRADUATE ACADEMIC PROGRAMS

OFFICE USE ONLY
Control # BPHYS-20131031

After college/school/campus review, send a signed original and 1 copy to the Curriculum Office/.

For information about when and how to use this form: http://depts.washington.edu/uwcr/1503instructions.pdf

College/Campus UWB	**Department/Unit** The STEM School	**Date** 10/31/2013

New Programs

- ☐ Leading to a Bachelor of _____ in _____ degree.
- ☐ Leading to a Bachelor of _____degree with a major in _____.
- ☐ Leading to a _____ Option within the existing major in _____.
- ☒ Leading to a minor in **PHYSICS**

Changes to Existing Programs

- ☐ New Admission Requirements for the Major in _____ within the Bachelor of _____.
- ☐ Revised Admission Requirements for the Major in _____ within the Bachelor of _____.
- ☐ Revised Program Requirements for the Major in _____ within the Bachelor of _____.
- ☐ Revised Requirements for the Option in _____within the major in _____.
- ☐ Revised Requirements for the Minor in _____.

Other Changes

- ☐ Change name of program from _____ to _____.
- ☐ Change delivery method or location of program.
- ☐ New or Revised Continuation Policy for _____.
- ☐ New Honors Requirements for _____.
- ☐ Eliminate program in _____.

Proposed Effective Date: **Quarter:** ☒ Autumn ☐ Winter ☐ Spring ☐ Summer **Year: 20 14**

Contact Person: **Dan Jaffe**	Phone: **2-3775**	Email: **djaffe@uw.edu**	Box:

EXPLANATION OF AND RATIONALE FOR PROPOSED CHANGE

For new program, please include any relevant supporting documentation such as student learning outcomes, projected enrollments, letters of support and departmental handouts. (*Use additional pages if necessary*).

Proposal Attached

OTHER DEPARTMENTS AFFECTED

List all departments/units/ or co-accredited programs affected by your new program or changes to your existing program and acquire the signature of the chair/director of each department/unit listed. Attach additional page(s) if necessary. *See online instructions.

Department/Unit:	Chair/Program Director:	Date:
Department/Unit:	Chair/Program Director	Date:

CATALOG COPY

Catalog Copy as currently written. Include only sections/paragraphs that would be changed if your request is approved. Please cross out or otherwise highlight any deletions.

PROPOSED CATALOG COPY

Reflecting requested changes (Include exact wording as you wish it to be shown in the printed catalog. Please underline or otherwise highlight any additions. If needed, attach a separate, expanded version of the changes that might appear in department publications). **Please note:** all copy will be edited to reflect uniform style in the General Catalog.

APPROVALS

Chair/Program Director:	Date: 11/1/13
College/School/Campus Curriculum Committee:	Date: 11-1-13
Dean/Vice Chancellor:	Date: 11-2-13
Faculty Council on Academic Standards/ General Faculty Organization/Faculty Assembly Chair:	Date: 11-1-13

POST TRI-CAMPUS APPROVAL (when needed)

Faculty Council on Academic Standards/ General Faculty Organization/Faculty Assembly Chair:	Date: 1-31-14

UNIVERSITY OF WASHINGTON

BOTHELL

Office of the General Faculty Organization

To: Bjong Wolf Yeigh, Chancellor

From: Jerelyn Resnick, Chair, GFO Executive Council

Copy: Susan Jeffords, Vice Chancellor for Academic Affairs,
Kari Lerum, Chair, GFO

RE: GFO Executive Council Endorsement to forward the School of STEM's Proposal for a new Minor in Physics to the UW Registrar for Tri-campus review.

Date: October 8, 2013

The General Faculty Organization's Executive Council endorses forwarding the School of STEM's Proposal for a new Minor in Physics to the UW Registrar for Tri-campus review.

Proposal

For a minor offering in

Physics

Autumn 2013

Submitted by The Physics Group:
Andrew Abian, Robin Barnes-Spayde, Warren W. Buck, Steve Collins, Matt DePies, Erin Hill, Subramanian Ramachandran, Eric Salathe

Proposal 1

For a minor offering in 1

Physics 1

Autumn 2013 1

I. Objective 3

II. Rationale 3

III. Educational Objectives (What students will do after graduation) 4

IV. Educational Outcomes (What students should be able to do at graduation) 5

V. Minor Requirements 5

VI. Proposed Catalog Description 6

VII. Budget Impact 6

Proposal for a Minor in Physics

Science, Technology, Engineering, and Mathematics (STEM)
University of Washington Bothell
Autumn 2013

I. Objective

A Physics minor enhances opportunities for students from across the campus to acquire reasoning skills, competencies, and experiences that will enable them to contemplate careers in physics, astrophysics, biophysics and a variety of other sciences,. Students will acquire fundamental knowledge that complements major programs of study.

II. Rationale

A minor in physics is a strategic imperative in moving towards a major in physics, the next step in implementing UW Bothell's STEM initiative. As UWB grows from the present 3,648 undergraduate students to 6,000 or more students in the next four or five years, having a physics major, and minor, supports intentional planning to meet the anticipated demand. Studies from the American Institute of Physics (AIP) have recently cited the growing connection between physics and biology as a critical new direction in STEM education.

We are located in one of the most robust biomedical and biotech regions of the country. This sequence of courses will enable students to further understand not only more advanced physics, astronomy, cosmology, biophysics, and condensed matter physics, but also to participate in the practice of a variety of sciences including physics, biology, engineering, chemistry, biomedical fields, and social sciences. Students selecting this minor will benefit from the diverse selection of courses and teaching styles needed to boost learning in all STEM disciplines.

In addition, introducing the physics major, and minor, will better serve the existing majors of Biology, Electrical Engineering, and Climate Sciences and Policy at UWB. The courses proposed are complementary to concentrations and majors in other programs and align with the 21st Century Initiative in STEM.

The minor is purposefully structured to ensure that students have more flexibility in their choices. For example, a student of climate science and policy can take courses in thermodynamics and astrophysics, which will lead to a broader understanding of climate beyond just the Earth. A student of biology can take courses in biophysics and astrophysics that will lead to the exciting new field of exobiology. Mechanical and electrical engineers can take courses in thermodynamics and condensed matter physics to further their

understanding of the physics of matter. Consciousness students can take courses in cosmology to further their understanding of humanities' place in the universe including the innovative advances of physics.

In the future, as the physics major is created, the number of courses will grow and an even broader range of students can be served. As an example, students of mathematics would be interested in classes on Einstein's General Theory of Relativity. More advanced biophysics, condensed matter, statistical physics, and quantum mechanics courses will be useful to students of engineering, biology, chemistry, biochemistry, and mathematics.

A physics major or minor, better prepares UWB students for science and technology jobs in both public and private sectors. It is widely understood that a strong physics background is an excellent platform upon which to launch oneself into any STEM area of academics as well as into industry. As an example, a recent edition of Physics Today (April 2012) lists advertisements for positions not only in physics and industry but also in chemistry and management.

The frequency of course offerings or delivery may be the equivalent of 2 courses per quarter for 3 quarters; this translates to 30 credits needed for the minor. Any UW Bothell undergraduate student with at least sophomore standing (45 credits completed) who is declared in a major may declare the minor.

III. Educational Objectives *(What students will do after graduation)*

The minor provides an interdisciplinary focus to the educational experience of UWB students. It will enhance acquired learning and, in turn, increase post baccalaureate opportunities for employment and/or continued education. Graduates with this minor will be able to apply the skills learned to accent their majors so that it strengthens their ability to understand science in general, and to perform well either in graduate/professional school or in industry.

Business majors, for example, will be prepared to apply their knowledge of management, finance, and marketing to the specific needs and context of the business of science, as well as towards private technology companies. Biology, Computing and Software Systems, and Engineering majors, likewise, will be well positioned to practice their acquired technical skills in industry as well as in graduate and professional areas. For Interdisciplinary Arts and Sciences graduates, knowledge of physics, biophysics, astronomy, and cosmology will give UWB graduates a competitive edge in securing technical as well as nontechnical jobs in industrial and other sectors. Graduates with this minor will also be in position to fit into emerging technological fields that may include new energy sources like vehicles that operate solely on electric and fuel cells.

IV. Educational Outcomes *(What students should be able to do at graduation)*

- Apply critical thinking skills and quantitative reasoning abilities to the physical world.
- Apply the principles and theories of physics to a variety of areas in the sciences and other evidence-based endeavors.
- Understand the history, organization, and underlying principles of physics and the application of these principles to the physical world.
- Anticipate and assess trajectories of technological change in a variety of industries using physics along with critical thinking abilities developed during physics courses.
- Utilize physics learned in courses such as thermodynamics, modern physics, and other areas in the design and optimization of new technologies.
- Explore ethical implications of physics on nature and society

V. Minor Requirements

The Minor in Physics requires completion of 30 credits, with minimum average GPA of 2.00, distributed as follows: (Courses in **bold** are courses that will be proposed to be added to the School of STEM suite of courses.)

Prerequisites: BPHYS 121 (12X courses include intro labs) or BPHYS 114 with BPHYS 117 lab. Other prerequisites are listed under each course.

1. Common core (15 credits):

- BPHYS 122 Electromagnetism and Oscillatory Motion [5 cr]
  - BPHYS 121 Mechanics or BPHYS 114 General Physics and BPHYS 117 General Physics Laboratory
- BPHYS 123 Waves [5 cr]
- **BPHYS 224 Thermal Physics** [5 cr]
  - BPHYS 123

2. Electives (minimum 15 credits) from the following list:

- **BPHYS 221 Classical Mechanics** [5 cr]
  - STMATH 307 Introduction to Differential Equations
- **BPHYS 222 Modern Physics** [5 cr]
  - STMATH 307 Introduction to Differential Equations
- **BPHYS 227 Mathematical Physics** [5 cr]
  - STMATH 307 Introduction to Differential Equations
  - STMATH 308 Matrix Algebra with Applications
- **BPHYS 229 Biophysics I** [5 cr]
  - BPHYS 224 Thermal Physics

- **BPHYS 311 Introduction to Astrophysics I** [5 cr]
  - BPHYS 221 Classical Mechanics
- **BPHYS 314 Introduction to Cosmology** [5 cr]
  - BPHYS 221 Classical Mechanics
  - BPHYS 222 Modern Physics
- **BPHYS 321 Electricity and Magnetism I** [5 cr]
  - STMATH 307 Introduction to Differential Equations
- **BPHYS 324 Quantum Mechanics I** [5 cr]
  - BPHYS 221 Classical Mechanics
  - BPHYS 222 Modern Physics
- **BPHYS 328 Statistical Mechanics** [5 cr]
  - BPHYS 224 Thermal Physics
- **BPHYS 423 Condensed Matter Physics** [5 cr]
  - BPHYS 324 Quantum Mechanics I
- **BPHYS 429 Biophysics II** [5 cr]
  - BPHYS 229 Biophysics I

Credit from courses such as electricity and magnetism (B EE 361) offered for engineers at UWB may be accepted as part of this minor.

VI. Proposed Catalog Description

The minor in physics covers a broad range of fundamental physical sciences, with applications to other scientific and science related fields. Topics covered by the minor include classical and quantum mechanics, astrophysics, modern cosmology, mathematical physics, condensed matter physics, and biophysics, along with core subjects such as modern physics and thermodynamics. Students of biology, business, engineering, environmental science, chemistry, mathematics, and climate science will find relevant courses to further their educational goals.

VII. Budget Impact

The Physics group staffing is as follows:

- one full professor.
- one full time lecturer.
- two full time lecturers teaching for physics part time.
- two part-time lecturers.

While a new regular faculty hire will be needed as the program grows, the current staff can teach sufficient courses to get the minor started. Therefore, launching this minor will take place once a sufficient number of courses have been successfully introduced to the

curriculum.

Adding this minor increases the workload of the School of STEM advisors and we propose that additional advising staff be retained.

The initial set of offerings does not require additional lab space beyond what is already in place and planned in the new science building (UWB3). Going beyond the proposed physics minor (e.g. initiating physics major) will require additional lab space for advanced lab courses.

The estimated number of students graduating with this minor is between 10 – 15 students annually for the next five years.

At the time of submittal of this proposal, no special IT needs have been identified.

Undergraduate Curriculum Review Process for New Programs

Bothell: Minor in Physics (BPHYS-20131031)

uwcr
uwcr

Edit Quote Permalink

Please review the attached 1503 pdf requesting to establish a minor in Physics at the Bothell campus and post comments by 5:00 pm on Wednesday, December 4h.

If you have any problems viewing the attachment or need disability accommodations, please contact the University Curriculum Office at uwcr@uw.edu.

Attachments

BPHYS-20131031.pdf
Download View

d6423
DONALD J. JANSSEN

Delete Edit Quote Permalink

This minor could be completed with only lower-division courses (the prerequisite of Differential Equations, a 300-level course at Bothell, is a 200-level course at Community Colleges).

I suggest including a minimum number of upper-division credits (at least 10) to make this a legitimate minor.

Don Janssen
Associate Professor of Civil Engineering

rjjense
RYAN JENSE

Delete Edit Quote Permalink

I strongly support the idea of enhancing the STEM workforce with foundations in Physics. I have found the conceptual/intellectual framework of Physics to likely be the most important of the Scientific disciplines on many fronts.

It seems to me that Physics offers the best Logic for explaining the world around us - whether it is at the sub-atomic, molecular, network systems, human systems, or the concepts of space/time.

Our communities will benefit from more students interacting with Physics at earlier junctures.

blayneh
BLAYNE HECKEL

Delete Edit Quote Permalink

The Physics Department at the UW Seattle campus supports the proposed Bothell physics minor. The degree requirements are similar to those of the Seattle campus Experimental Physics Minor path.

The suggestion to require some 300 level credits in addition to STMATH 307 should be seriously considered,
but it's not a major concern for us because there is little distinction between 200 and 300 level courses in physics. (For example, the syllabi for "classical mechanics" and "electricity and magnetism" would be similar whether they were taught at the 200 level as they are at many places, or at the 300 level as they are in
our Department.)

Blayne Heckel,
Chair, Physics

MEMO

To: **Undergraduate Curriculum Review**
UW Bothell GFO EC
From: **Annette Anderson**

Date: **1/30/2014**

Re: ***Proposal for Physics Minor: Response to Comments***

The proposal for the Minor in Physics received 3 comments. Comment 2 does not require a response; the response to comments 1 and 3 was prepared by Warren Buck, Chancellor Emeritus; Professor, the STEM School.

COMMENTS

1. This minor could be completed with only lower-division courses (the prerequisite of Differential Equations, a 300-level course at Bothell, is a 200-level course at Community Colleges).

   I suggest including a minimum number of upper-division credits (at least 10) to make this a legitimate minor.
   Don Janssen
   Associate Professor of Civil Engineering

2. The Physics Department at the UW Seattle campus supports the proposed Bothell physics minor. The degree requirements are similar to those of the Seattle campus Experimental Physics Minor path.
   The suggestion to require some 300 level credits in addition to STMATH 307 should be seriously considered, but it's not a major concern for us because there is little distinction between 200 and 300 level courses in physics. (For example, the syllabi for "classical mechanics" and "electricity and magnetism" would be similar whether they were taught at the 200 level as they are at many places, or at the 300 level as they are in
   our Department.)
   Blayne Heckel,
   Chair, Physics

RESPONSE

We decided to not offer 300 level courses for the minor as Blayne H suggests. The major in physics proposal which is in development will have plenty of 300 level courses.

UNIVERSITY CAMPUSES UNDERGRADUATE PROGRAM REVIEW PROCEDURES**

CHECKLIST

Title of Proposal: Minor in Physics

Proposed by (unit name): School of STEM

Originating Campus:

___UW, Seattle

_X_UW, Bothell

___UW, Tacoma

I. **Phase I. Developed Proposal Review** (to be completed by Originating Campus' Academic Program Review body)

A. Review Completed by: (list name of program review body)

Chaired by:

11/01/13Date proposal received by originating campus's review body

11/12/13 Date proposal sent to University Registrar

11/13/13 Date proposal posted & email sent to standard notification list

01/31/14 Date of originating campus's curriculum body approval
(Note: this date must be 15 business days or more following date of posting)

B. _3___ Number of comments received. Attach the comments and a summary of the consideration and responses thereof : (1-2 paragraphs)

II. **Phase II. Final Proposal Review** (to be completed by FCTCP)

A. Review Completed by:
___ FCTCP subcommittee
_x_ FCTCP full council
Chaired by: William Erdly

2/11/14 Date request for review received from University Registrar
3/6/14 Date of FCTCP report

B. Review (attached)

YES NO
_x_ ___ Was notice of proposal posted on UW Website for 15 business days?
_x_ ___ Was notice of proposal sent to standard mailing list 15 business days in advance of academic program review?
_x_ ___ Were comments received by academic program review body?
_x_ ___ Was response to comments appropriate? (explain, if necessary)
___ _x_ Was final proposal reviewed by FCTCP within 14 days of receipt?
_x_ ___ Was there adherence to the University Campuses Undergraduate Program Review Process? (explain, if necessary)

Report slightly delayed as a high volume of proposals received.

C. Recommendation

_x_ Forward for final approval
___ Forward to Provost because of University issues (Explain)
___ Return to campus council because of insufficient review (Explain).

**Endorsed by Faculty Senate Executive Committee, 1/10/05, modified 1/31/06; These procedures apply to new undergraduate degrees, majors, minors (and certificates) and substantive changes to same