## Curriculum Proposal

### PHYS 17-18 #11

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#### Course Modification

- **1.2 PHYS 3400 Math Methods for Engineering to Mathematical Physics (3 credits); description and prerequisite change**

- **1.4 PHYS 3600 Modern Physics (4 credits) to PHYS 3103 Physics III (4 credits); description and prerequisite change**

#### Program Modification

- **1.6 Physics, B.S. minor**

#### Program Drop

- **1.10 Physics, B.A. minor**

#### Signatures
BSU Curriculum Forms

Form 1

Curriculum Modification Summary

College: College of Arts and Sciences
Department: Physics
Proposer: Ryan Sayer
Proposer’s position: Assistant Professor
Describe the modification(s) you propose, and how they will work to students' advantage:

Currently, the two physics minor programs suffer from too few participants. This makes them difficult to maintain for the students that do show interest. We propose a restructuring of the physics minor programs by eliminating the Physics B.A. minor and changing the name and course requirements of the Physics B.S. minor. We are removing the “B.S.” designation from the Physics B.S. minor title. We are eliminating PHYS 2500 Electronics I (4 credits) from the required courses; the total required credits will now be 30 instead of 34. We are allowing two semesters of physical chemistry courses (CHEM 4711 and CHEM 4712) to substitute for one of the two elective physics course. By altering the requirements and eliminating redundancies, we hope to make a single physics minor that is both more appealing and more accessible to a larger number of students.

As part of the changes, we are rebranding PHYS 3600 Modern Physics as PHYS 3103 (Physics III). This course is an important gateway to participation in other 3000-level physics courses. We hope that this change will increase participation in this course, which could open up opportunities for future growth of the physics program at BSU. We are also changing the name of PHYS 3400 from “Math Methods for Engineering” to “Mathematical Physics” and altering the description to emphasize a more general, less engineering-oriented approach. This should make the course more appealing to Applied Mathematics majors and students of other physical sciences (such as chemistry).

Modifications proposed (specify number of each):
- 2 Course Modification(s) (form 2)
- ___ New Course(s) (form 3)
- ___ Course Drop(s) (form 4)
- 1 Program Modification(s) (form 5)
- ___ New Program(s) (form 6)
- 1 Program Drop(s) (form 7)

The modifications affect (check):
- ___ Liberal Education
- 1 Undergraduate Curriculum
- ___ Graduate Curriculum
- ___ Teacher Licensure Program(s)
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
Undergraduate: PHYS 3400
Graduate:

Proposed Course Number(s), if different:
Undergraduate:
Graduate:

Current Course Title: Math Methods for Engineering
Proposed Course Title, if different: Mathematical Physics

Current Course Description:
Introduction to ordinary and partial differential equations with emphasis on engineering applications; Laplace and Fourier transforms, series solutions, systems of ordinary differential equations, and phasor analysis. Prerequisites: MATH 2472, PHYS 1102 or PHYS 2102 (Might not be offered every year.)

Proposed Course Description, if different:
Introduction to mathematical techniques used to solve problems in the physical sciences. Topics include complex analysis, vector fields, Fourier series, ordinary and partial differential equations, and series solutions. Prerequisites: MATH 2472 and PHYS 2102.

Current Credits: 3
Proposed Credits, if different:

Current Prerequisite(s):
Undergraduate: MATH 2472, PHYS 1102 or PHYS 2102
Graduate:

Proposed Prerequisite(s), if different:
Undergraduate: MATH 2472 and PHYS 2102
Graduate:

1) Reason(s) for change(s):
The original course name and description are tailored for engineering students. This is a holdover from when the physics department had a robust Engineering Physics major and several faculty members with engineering backgrounds. The goals and faculty resources of the physics department have changed since then. We would like the PHYS 3400 course name and description to reflect a more general approach to physics with less emphasis on engineering.
2) May this modified course replace the current course for students remaining in the old curriculum? Yes __X__ No _____ If not, please drop the current course and submit a new course form for the modification.

3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**
   - Student Learning Outcomes: Yes _____ No __X__
   - Major Content Areas: Yes _____ No __X__
   - Projected Maximum Class Size (Cap): Yes _____ No __X__

4) Current Course fee(s) per student: $ 0
   Proposed Course fee(s) per student, if different: $ 0

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:
   a) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),
   b) click on “Areas of Study, and Course Descriptions,”
   c) click on “PDF of Entire Catalog” in upper right,
   d) press Ctrl F, and enter the prefix and number of the course(s) from this form.

Non-licensure programs:

Physics minor, B.A.

Physics minor, B.S.

Teacher Licensure programs:

Liberal Education:

No service areas outside of the physics department will be affected by this course change.
BSU Curriculum Forms

Course Modification Form

Current Course Number(s):
  Undergraduate: **PHYS 3600**
  Graduate:
Proposed Course Number(s), if different:
  Undergraduate: **PHYS 3103**
  Graduate:

Current Course Title: **Modern Physics**
Proposed Course Title, if different: **Physics III**

Current Course Description:
A first course in quantum systems. Topics include historical perspectives, classic experiments, an introduction to quantum mechanics, and applications in atomic and nuclear structure and spectroscopy. Lecture and Laboratory. Prerequisites: PHYS 2102, MATH 2472, or consent of instructor.

Proposed Course Description, if different:
An introductory course on modern physics. Topics include special relativity, quantum mechanics, atomic physics and radiation, elementary particles, and astrophysics. Lecture and Laboratory. Prerequisites: PHYS 2102, MATH 2472, or consent of instructor.

Current Credits: **4**
Proposed Credits, if different:

Current Prerequisite(s):
  Undergraduate: **PHYS 2102, MATH 2472**
  Graduate:
Proposed Prerequisite(s), if different:
  Undergraduate:
  Graduate:

1) Reason(s) for change(s):
The modern physics course is an essential component of the physics minor. However, the last few times our department has offered the course, the enrollment has been too low. By rebranding the course as PHYS 3103 (Physics III) rather than PHYS 3600 (Modern Physics), we believe that this course will appear more accessible to students who have successfully taken PHYS 2102 (Physics II) but who might be intimidated by the title “Modern Physics”. We also hope with the number and name change to make it clearer to
students that this course is the next logical step of the introductory physics sequence after PHYS 2101 and PHYS 2102.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes __X__ No ______ If not, please drop the current course and submit a new course form for the modification.

3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**
   - Student Learning Outcomes: Yes ____ No __X__
   - Major Content Areas: Yes ____ No __X__
   - Projected Maximum Class Size (Cap): Yes ____ No __X__

4) Current Course fee(s) per student: $ 0
   Proposed Course fee(s) per student, if different: $ 0

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below. To locate where this course appears please search the online catalog, as follows:

   Non-licensure programs:
   **Chemistry B.S., Chemistry Emphasis**

   Physics Minor, B.S.

   Teacher Licensure programs:
   **Science Education B.S., Physics Specialty (Teacher Licensure)**

   The above “service area” programs/departments were notified of this modification on 11/01/17 by email.

   Please check one of the items below:
   
   _____ No comments were received from other programs or departments within one week of the notification.

   __X__ Comments were received within one week of the notification, and are attached.

   “That name change is fine from the Chem Department’s point of view.”—Keith Marek
BSU Curriculum Forms

Form 5

Program Modification Form

Program to be modified:
**Physics B.S. minor**

List all proposed change(s):

1. New name:
   **Physics minor** (remove the B.S. label)

2. We are removing PHYS 2500 from the list of required courses to shorten the required credits from 34 to 30.

3. The course listed as “PHYS 3600 Modern Physics” will now be listed as “PHYS 3103 Physics III” based on the name revision we are currently submitting for this course (see enclosed Form 2).

4. We are allowing students the substitute CHEM 4711 and CHEM 4712 in place of one 3-credit elective physics course, so that they only need to complete one additional 3-credit elective PHYS course. CHEM 4711 and CHEM 4712 primarily deal with thermodynamics and quantum mechanics, so we feel there is a close enough overlap with the physics program to justify this substitution.

Reason(s) for the change(s):
We would like to make the physics minor more accessible to our students. The minor is currently 34 credits, which we feel is too large for our current department. PHYS 2500 Electronics I is being removed from the required course list because the present physics department faculty does not have the electrical engineering interest to offer it on a regular basis. By allowing CHEM 4711 and CHEM 4712 to replace 3 required elective credits, we hope to make the physics minor a more viable option for chemistry majors, which will hopefully increase overall enrollment in the minor. We are also dropping the B.S. label from the minor title. Since we are eliminating the B.A. minor, the distinction is no longer needed. Having two different physics minors is unnecessary and potentially confusing for students.

**Note:** In order to avoid hidden prerequisites, if a course is being dropped from this program (but not from the entire curriculum), please check for which remaining courses may include this dropped course as a prerequisite. Course prerequisites may be found in the online catalog ([http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/)). Remedies for hidden prerequisites may be found under Curriculum Forms at ([http://www.bemidjistate.edu/faculty_staff/faculty_association/forms/](http://www.bemidjistate.edu/faculty_staff/faculty_association/forms/)).
Note: If a course from another department/program was either added to or dropped from this program, please notify the chair/coordinator of that course's department/program and indicate the following:

The chemistry department was notified of the addition of their courses on 11/2/17 by email.

Please check one of the items below:

_____  No comments were received from other programs or departments within one week of the notification.

___X___  Comments were received within one week of the notification, and are attached.

“That sounds like a good idea, and I know this has been discussed in the past. I imagine this wouldn’t be a problem for the chemistry department, as it would increase enrollment in p-chem courses.” ---Keith Marek

Note: If this is a joint program, the signatures of both department chairs (and both deans, if different colleges) must be provided.

Alert: Attach a copy of the current program showing the marked changes.

Please copy the current program from the online catalog (http://www.bemidjistate.edu/academics/catalog/) and paste it into Word. Then use either the Track Changes feature under Tools, or the underline and strikethrough Font feature under Format. (Please note that the Track Changes feature may be easily switched on and off by holding down the Ctrl+Shift+E keys.)
Physics, B.S. minor

PHYSICS MINOR, B.S. REQUIREMENTS

MUST COMPLETE ALL AREAS WITH A TOTAL OF AT LEAST 34 SEMESTER CREDITS AND A 2.00 GPA

Required Credits: 30
Required GPA: 2.00

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSES:

- MATH 2471 Calculus I (5 credits)
- MATH 2472 Calculus II (5 credits)
- PHYS 2101 Physics I (5 credits)
- PHYS 2102 Physics II (5 credits)
- PHYS 2500 Electronics I (4 credits)
- PHYS 3600 Modern Physics III (4 credits)

II REQUIRED ELECTIVES

SELECT 6 SEMESTER CREDITS FROM PHYSICS COURSES

OR COMPLETE THE FOLLOWING COURSES:
(SOME COURSES IN THIS SECTION REQUIRE PRE-REQUISITES THAT ARE NOT PART OF THIS PROGRAM)

- CHEM 4711 Physical Chemistry I (3 credits)
- CHEM 4712 Physical Chemistry II (3 credits)
- Any PHYS course numbered 3150 or above
Physics minor

PHYSICS MINOR REQUIREMENTS

Required Credits: 30
Required GPA: 2.00

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSES:

• MATH 2471 Calculus I (5 credits)
• MATH 2472 Calculus II (5 credits)
• PHYS 2101 Physics I (5 credits)
• PHYS 2102 Physics II (5 credits)
• PHYS 3103 Physics III (4 credits)

II REQUIRED ELECTIVES

SELECT 6 SEMESTER CREDITS FROM PHYSICS COURSES

OR COMPLETE THE FOLLOWING COURSES:
(SOME COURSES IN THIS SECTION REQUIRE PRE-REQUISITES THAT ARE NOT PART OF THIS PROGRAM)

• CHEM 4711 Physical Chemistry I (3 credits)
• CHEM 4712 Physical Chemistry II (3 credits)
• Any PHYS course numbered 3150 or above
BSU Curriculum Forms

Form 7
(Updated: 9.15.15)

Program Drop Form

Program to be dropped:
Physics B.A. minor

Reason(s) for dropping it:
We already have another physics minor program, which is currently called “Physics B.S. minor”. Having two physics minors with slightly different names is redundant and potentially confusing for students. We want to have a single physics minor program that does not make the distinction between B.A. and B.S., so we are eliminating this minor and changing the name of the other minor to simply “Physics minor” without the B.S. label (See Form 5 included with this packet).

Unlike the Physics B.S. minor, the Physics B.A. minor does not specifically require PHYS 3600 Modern Physics (soon to be called PHYS 3103 Physics III, see form 2). Students pursuing the Physics B.A. minor might not enroll in PHYS 3600 when it is offered. This might be hurting PHYS 3600’s enrollment numbers and affecting the course’s availability. However, the topics of modern physics discussed in PHYS 3600 are important for establishing a foundation of conceptual understanding necessary for the physics topics treated in some of the other 3000-level physics courses. For this reason, we feel that the Physics B.A. minor is not as well suited as the Physics B.S. minor to meet our students’ needs, so the Physics B.A. minor should be the one eliminated.

There are no courses outside the physics department listed in this minor, so no other departments will be affected by dropping the minor.

Alert:
- Contact the Assistant Vice-President for Academic Affairs regarding notification downstate.
BSU Curriculum Forms

Form 8
Updated: 09.18.15

Signatures

Ryan Sayer / Assistant Professor of Physics / 11.02.2017
Proposer / Title / Date

John Truedson / Physics Department Chair / 11.02.2017
Chair or Director / Department or Program / Date
Note: "All departmental recommendations [on curriculum] must be reviewed and approved by the department's faculty."--IFO/MnSCU Master Agreement 2009-2011, 20.A.3 (p. 80).

At this point, packet goes to Records Office/Curriculum Coordinator to be logged in to the Curriculum Proposal Progress Grid.

Colleen Greer / Dean of College of Arts and Sciences / 12.04.2017
Dean / College / Date

Note: If proposal is sent back to the Proposer, please notify the Curriculum Coordinator. If approved, packet goes to Academic Affairs Office.