# Curriculum Proposal

**PHYS 19-20 #7**

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## Course Modification

**1.3 PHYS 1101 General Physics I (4 credits); description change**

**Liberal Education Goal Area 3**

**1.5 PHYS 1102 General Physics II (4 credits); description change**

**Liberal Education Goal Area 3**

**1.7 PHYS 2101 Physics I (5 credits); description and prerequisite change**

**Liberal Education Goal Area 3**

**1.10 PHYS 2102 Physics II (5 credits); description and pre/co-requisite change**

**Liberal Education Goal Area 3**

**1.12 PHYS 2500 Electronics I (4 credits) to PHYS 2500 Electronics; description and pre/co-requisite change**

**1.14 PHYS 3103 Physics III (4 credits); description change**

**1.16 PHYS 3300 Thermodynamics and Heat Transfer (3 credits) to PHYS 3300 Thermal and Statistical Physics (3 credits); description and prerequisite change**

**1.18 PHYS 3400 Mathematical Physics (3 credits); description and prerequisite change**

**1.20 PHYS 3720 Advanced Laboratory (1 credit); description change**

**1.22 PHYS 4310 Mathematical Methods in Applied Physics (3 credits) to PHYS 4400 Mathematical Physics II; description and prerequisite change**

**1.24 PHYS 4540 Electromagnetic Fields and Waves (4 credits) to PHYS 4500 Electromagnetism (4 credits); description and prerequisite change**

**1.26 PHYS 4580 Optics (4 credits) to PHYS 4300 Optics (4 credits); description and prerequisite change**

**1.28 PHYS 4610 Quantum Mechanics (3 credits) to PHYS 4700 Quantum Mechanics (3 credits); description and prerequisite change**

**1.30 PHYS 4660 Solid State Physics (3 credits) to PHYS 4100 Solid-State Physics (3 credits); description and prerequisite change**

**1.32 PHYS 4680 Theoretical Physics (4 credits) to PHYS 4800 Special Topics in Theoretical Physics (3 credits); prerequisite change**

## New Courses

**1.34 PHYS 3700 Classical Mechanics (3 credits)**

## Course Drops

**1.39 PHYS 1230 Introduction to Engineering (2 credits)**

**1.40 PHYS 2150 Acquisition and Control with G Programming (3 credits)**

**1.41 PHYS 3150 Circuit Analysis (4 credits)**

**1.42 PHYS 3230 Fluid Mechanics (3 credits)**

**1.43 PHYS 3250 Acoustics and Vibrations (3 credits)**

**1.44 PHYS 3270 Systems and Controls (4 credits)**

**1.45 PHYS 3500 Electronics II (4 credits)**

**1.46 PHYS 4120 Engineering Simulation and Design (2 credits)**

**1.47 PHYS 4720 Applied Controls (2 credits)**

**1.48 PHYS 4751 Engineering Design Project I (2 credits)**

**1.49 PHYS 4752 Engineering Design Project II (2 credits)**

1.50 **Signatures**
BSU Curriculum Forms

Form 1

Curriculum Modification Summary

College: Business, Mathematics & Science
Department: Physics
Proposer: Ryan Sayer
Proposer’s position: Assistant Professor of Physics
Describe the modifications you propose, and how they will work to students' advantage:

First, we are eliminating eleven courses from our catalog. These courses were at one time of value to students pursuing the engineering physics major before it was eliminated, but they do not complement our current physics program and they are no longer of use to our students, so we do not plan to offer them again in the future.

Second, we are making small modifications to the title, course number, descriptions, and/or prerequisites of most of our remaining physics courses. These modifications to the physics catalog serve three primary purposes:
(1) To remove outdated references to the physics and engineering majors that no longer exist at BSU. For example, the reference to “physics and engineering majors” in the descriptions of PHYS 1101 and PHYS 1102 has caused some confusion for students in the past.
(2) To improve the clarity of the physics program by improving course names, descriptions, and the numbering of the upper-division courses. We have simplified some of the verbiage in the course titles and descriptions to make the topics covered by these courses clearer to students.
(3) To improve enrollment in upper-division physics courses and make the courses more accessible to students by relaxing some of the prerequisites. Many of these prerequisites were originally set when the physics program was much larger than its current size. However, our department must now carefully decide which upper-division physics courses to offer each semester. These proposed prerequisite modifications will give our physics minors greater freedom and a clearer path to taking 4000-level physics courses at BSU.

Finally, we are creating a new course, PHYS 3700 Classical Mechanics, to fulfill the need for an upper-division course on Newtonian mechanics at BSU. This course is a common feature in physics majors and minors at other universities around the nation. PHYS 3700 will help students to solidify and deepen their understanding of the mechanics principles they learned in Physics I.

Modifications proposed (specify number of each):
_15__Course Modification(s) (form 2)
__1__New Course(s) (form 3)
_11__Course Drop(s) (form 4)
Program Modification(s) (form 5)
New Program(s) (form 6)
Program Drop(s) (form 7)
The modifications affect (check):
X Liberal Education
X Undergraduate Curriculum
Graduate Curriculum
X Teacher Licensure Program(s)
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
   Undergraduate: PHYS 1101
   Graduate:
Proposed Course Number(s), if different:
   Undergraduate:
   Graduate:

Current Course Title: General Physics I
Proposed Course Title, if different:

Current Course Description:
A survey of introductory physics, with laboratory. Topics include mechanics, vibrations, fluids, waves, heat, electricity, magnetism, dc circuits, optics. Elementary algebra and trigonometry are employed as needed. (Not for Physics or Engineering majors.) Liberal Education Goal Area 3 (LC).

Proposed Course Description, if different:
A survey of introductory physics, with laboratory. Topics include mechanics, vibrations, fluids, waves, heat, electricity, magnetism, dc circuits, and optics. Elementary algebra and trigonometry are employed as needed. Liberal Education Goal Area 3 (LC).

Current Credits: 4
Proposed Credits, if different:

Current Prerequisite(s):
   Undergraduate: None
   Graduate:
Proposed Prerequisite(s), if different:
   Undergraduate:
   Graduate:

1) Reason(s) for change(s):
The course description includes an outdated reference to the physics major and the engineering physics major, which no longer exist at BSU. This has caused confusion for students majoring in engineering technology offered by the Technology, Art & Design department.

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: Same

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     - Aquatic Biology, B.S. major Aquatic Systems emphasis
     - Aquatic Biology, B.S. major Fisheries Biology emphasis
     - Aquatic Biology, B.S. major Wetlands emphasis
     - Biochemistry, Cellular and Molecular Biology, B.S. major Cellular and Molecular emphasis
     - Biochemistry, Cellular and Molecular Biology, B.S. major Biochemistry emphasis
     - Biology, B.S. major
     - Biology, B.S. major Cellular and Molecular emphasis
     - Biology, B.S. major Medical Sciences emphasis
     - Medical Laboratory Science, B.S. 4+1 Option
     - Wildlife Biology, B.S.
     - Environmental Studies, B.S. major Geohydrology Emphasis
     - Exercise Science, B.S. major Fitness and Leadership Promotion emphasis
     - Exercise Science, B.S. major Medical Fitness emphasis
     - Engineering Technology, B.S.
   - Teacher Licensure programs:
     - Science Education, B.S. Physics Specialty
   - Liberal Education:
     - Goal Area 3

The above “service area” programs/departments were notified of this modification on **5/6/19** 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.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
Undergraduate: **PHYS 1102**
Graduate:
Proposed Course Number(s), if different:
Undergraduate:
Graduate:

Current Course Title: **General Physics II**
Proposed Course Title, if different:

Current Course Description:
Continuation of a survey of introductory physics, with laboratory. Topics include mechanics, vibrations, fluids, waves, heat, electricity, magnetism, DC circuits, optics. Elementary algebra and trigonometry are employed as needed. (Not for Physics or Engineering majors.) Liberal Education Goal Area 3 (LC).

Proposed Course Description, if different:
Continuation of a survey of introductory physics, with laboratory. Topics include mechanics, vibrations, fluids, waves, heat, electricity, magnetism, DC circuits, and optics. Elementary algebra and trigonometry are employed as needed. Liberal Education Goal Area 3 (LC).

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

Current Prerequisite(s):
Undergraduate: **None**
Graduate:
Proposed Prerequisite(s), if different:
Undergraduate:
Graduate:

1) Reason(s) for change(s):
The course description includes an outdated reference to the Physics and Engineering Physics majors, which no longer exist at BSU. This reference sometimes causes confusion for students majoring in engineering technology, which is offered by the Technology, Art & Design department.
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
   for: Proposed Course fee(s) per student, if different:
   for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     - Biochemistry, Cellular and Molecular Biology, B.S. major Cellular and Molecular emphasis
     - Biochemistry, Cellular and Molecular Biology, B.S. major Biochemistry emphasis
     - Biology, B.S. major
     - Biology, B.S. major Cellular and Molecular emphasis
     - Biology, B.S. major Medical Sciences emphasis
     - Medical Laboratory Science, B.S. 4+1 Option
     - Wildlife Biology, B.S.
     - Environmental Studies, B.S. major Geohydrology Emphasis
   - Exercise Science, B.S. major Fitness and Leadership Promotion emphasis
   - Exercise Science, B.S. major Medical Fitness emphasis
   - Engineering Technology, B.S.
   - Teacher Licensure programs:
     - Science Education, B.S. Physics Specialty

   Liberal Education:
   - Goal Area 3

The above “service area” programs/departments were notified of this modification on **5/6/19** (date) 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.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
Undergraduate: PHYS 2101
Graduate:
Proposed Course Number(s), if different:
Undergraduate:
Graduate:

Current Course Title: Physics I
Proposed Course Title, if different:

Current Course Description:
A calculus-based introductory physics sequence, with laboratory. Topics include mechanics, vibrations, waves, fluids, thermodynamics, electricity, magnetism, DC and AC circuits, optics. Prerequisite/corequisite: MATH 2471. Liberal Education Goal Area 3 (LC).

Proposed Course Description, if different:
First course of a calculus-based introductory physics sequence, with laboratory. Topics include Newton’s laws of motion, gravitation, fluids, vibrations and waves, sound, and ideal gases. Prerequisite: MATH 2471 or consent of instructor. Liberal Education Goal Area 3 (LC).

Current Credits: 5
Proposed Credits, if different:

Current Prerequisite(s):
Undergraduate: Prerequisite/corequisite: MATH 2471
Graduate:
Proposed Prerequisite(s), if different:
Undergraduate: MATH 2471 or consent of instructor
Graduate:

1) Reason(s) for change(s):

The course description now lists only the topics covered in Physics I and not the topics covered in Physics II. The description has been altered to emphasize that this is the first course in a three-course introductory physics sequence. Students must now have the instructor’s consent to take this course if they have not taken MATH 2471.
2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No _____

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
   for:
   Proposed Course fee(s) per student, if different:
   for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     Aquatic Biology, B.S. major Aquatic Systems emphasis
     Aquatic Biology, B.S. major Fisheries emphasis
     Aquatic Biology, B.S. Wetlands emphasis
     Biochemistry, Cellular and Molecular Biology, B.S. major Cellular and Molecular emphasis
     Biochemistry, Cellular and Molecular Biology, B.S. major Biochemistry emphasis
     Biology, B.S. major
     Biology, B.S. major Cellular and Molecular emphasis
     Biology, B.S. major Medical Sciences emphasis
     Wildlife Biology, B.S.
     Medical Laboratory Science, B.S. (4+1 Option)
     Chemistry, B.S. major Criminalistics emphasis
     Chemistry, B.S. major Biochemistry/Biotechnology emphasis
     Chemistry, B.S. major Environmental Chemistry emphasis
     Chemistry, B.S. major Chemistry emphasis
     Environmental Studies, B.S. major Geohydrology Emphasis
     Exercise Science, B.S. major Fitness and Leadership Promotion emphasis
     Exercise Science, B.S. major Medical Fitness emphasis
     Physics, minor
   
   - Teacher Licensure programs:
     Science Education, B.S. Physics Specialty
   
   - Liberal Education:
     Goal Area 3
The above “service area” programs/departments were notified of this modification on 5/6/19 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.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
Undergraduate: **PHYS 2102**
Graduate:
Proposed Course Number(s), if different:
Undergraduate:
Graduate:

Current Course Title: **Physics II**
Proposed Course Title, if different:

Current Course Description:
Continuation of a calculus-based introductory physics sequence, with laboratory. Topics include mechanics, vibrations, waves, fluids, thermodynamics, electricity, magnetism, DC and AC circuits, optics. Prerequisite/corequisite: MATH 2472. Liberal Education Goal Area 3 (LC).

Proposed Course Description, if different:
Continuation of a calculus-based introductory physics sequence, with laboratory. Topics include heat and thermodynamics, electricity, magnetism, electrical circuits, light, and optics. Prerequisite: PHYS 2101, MATH 2471. Pre/Co-requisite MATH 2472 or consent of instructor. Liberal Education Goal Area 3 (LC).

Current Credits: 5
Proposed Credits, if different:

Current Prerequisite(s):
Undergraduate: **Prerequisite/corequisite: MATH 2472**
Graduate:
Proposed Prerequisite(s), if different:
Undergraduate: **Prerequisite: PHYS 2101, MATH 2471. Pre/Co-requisite MATH 2472 or consent of instructor**
Graduate:

1) Reason(s) for change(s):

The course description now lists only the topics covered in PHYS 2102 and not the topics covered in PHYS 2101. PHYS 2101 has been added as a prerequisite since many of the topics discussed in PHYS 2102 build upon the concepts first introduced in PHYS 2101.
2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No _____

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 for:
   Proposed Course fee(s) per student, if different: Same for:

5) Service Areas:
This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     - Biochemistry, Cellular and Molecular Biology, B.S. major Cellular and Molecular emphasis
     - Biochemistry, Cellular and Molecular Biology, B.S. Biochemistry emphasis
     - Biology, B.S. major Medical Sciences emphasis
     - Biology, B.S. major
     - Biology, B.S. major Cellular and Molecular emphasis
     - Medical Laboratory Science, B.S. (4+1 Option)
     - Chemistry, B.S. major Chemistry emphasis
     - Exercise Science, B.S. major Fitness and Leadership Promotion emphasis
     - Exercise Science, B.S. major Medical Fitness emphasis
     - Physics, minor

   - Teacher Licensure programs:
     - Science Education, B.S. major Physics specialty

   - Liberal Education:
     - Goal Area 3

The above “service area” programs/departments were notified of this modification on 5/6/19 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.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
  Undergraduate: PHYS 2500
  Graduate:
Proposed Course Number(s), if different:
  Undergraduate:
  Graduate:

Current Course Title: Electronics I
Proposed Course Title, if different: Electronics

Current Course Description:
Use and analysis of digital ICs, with application to computer circuitry and interfacing. Intensive laboratory. Corequisite: PHYS 1101 or PHYS 2101, or consent of instructor.

Proposed Course Description, if different:
Use and analysis of digital ICs, with application to computer circuitry and interfacing. Intensive laboratory. Prerequisite: PHYS 1102 or PHYS 2102, or consent of instructor.

Current Credits: 4
Proposed Credits, if different:

Current Prerequisite(s):
  Undergraduate: Corequisite: PHYS 1101 or PHYS 2101, or consent of instructor.
  Graduate:
Proposed Prerequisite(s), if different:
  Undergraduate: Prerequisite: PHYS 1102 or PHYS 2102, or consent of instructor.
  Graduate:

1) Reason(s) for change(s):

We are eliminating the course PHYS 3500 Electronics II, so it no longer makes sense to call this course Electronics I and we are dropping the “I” from the name. Also, we are changing the prerequisite course to either PHYS 2102 or PHYS 1102 because we do not discuss electronic circuits until the second semester of intro physics, so PHYS 1102 and PHYS 2102 will prepare students better for this course.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No _____
3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**

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<th>Yes</th>
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<tr>
<td>Student Learning Outcomes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Major Content Areas</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Projected Maximum Class Size (Cap)</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

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

5) Service Areas:
This course is a requirement or an elective in the programs/areas listed below.
   Non-licensure programs:
   Computer Science, minor
   
   Teacher Licensure programs:
   Science Education, B.S. major Physics Specialty
   
   Liberal Education: None

The above “service area” programs/departments were notified of this modification on **5/8/19** 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.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
Undergraduate: PHYS 3103
Graduate:

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

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

Current Course Description:
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.

Proposed Course Description, if different:
Conclusion of a calculus-based introductory physics sequence with a focus on modern physics, with laboratory. Topics include special relativity, quantum mechanics, atomic physics and radiation, elementary particles, astrophysics and cosmology. Prerequisites: PHYS 2102, MATH 2472, or consent of instructor.

Current Credits: 4
Proposed Credits, if different:

Current Prerequisite(s):
Undergraduate: PHYS 2102, MATH 2472, or consent of instructor.
Graduate:

Proposed Prerequisite(s), if different:
Undergraduate:
Graduate:

1) Reason(s) for change(s):
We wanted the course description to emphasize that this is the final course in the three-course introductory physics sequence.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No _____
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
   for:
Proposed Course fee(s) per student, if different:
for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     Chemistry, B.S. major Chemistry emphasis
     Physics, minor
   - Teacher Licensure programs:
     Science Education, B.S. major Physics specialty
   - Liberal Education:
     None

The above “service area” programs/departments were notified of this modification on 5/6/19 by email.

Please check one of the items below:

- No comments were received from other programs or departments within one week of the notification.
- Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
  Undergraduate: PHYS 3300
  Graduate:
Proposed Course Number(s), if different:
  Undergraduate:
  Graduate:

Current Course Title: Thermodynamics and Heat Transfer
Proposed Course Title, if different: Thermal and Statistical Physics

Current Course Description:
Study of the theory and application of the laws of thermodynamics to control volumes, including an introduction to thermodynamic cycles for power generation, refrigeration, and heat pumps. Also, a study of the transfer of energy via heat, work, and mass, and of applications for the law of entropy. Prerequisites: MATH 2472 and PHYS 2102. (Might not be offered every year.)

Proposed Course Description, if different:
Principles of thermodynamics and statistical mechanics. Topics include temperature, the laws of thermodynamics, entropy, heat engines and refrigerators, free energy, and Boltzmann and quantum statistics. Prerequisites: PHYS 2102, PHYS 3103, MATH 2472, or consent of instructor.

Current Credits: 3
Proposed Credits, if different:

Current Prerequisite(s):
  Undergraduate: MATH 2472 and PHYS 2102
  Graduate:
Proposed Prerequisite(s), if different:
  Undergraduate: PHYS 2102, PHYS 3103, MATH 2472, or consent of instructor
  Graduate:

1) Reason(s) for change(s):

This course originally had a greater emphasis on engineering principles (such as energy generation and heat transfer) with little discussion of statistical mechanics. The course as it is now taught includes a significant treatment of statistical mechanics (including quantum statistics), which is how it is usually taught in physics programs at other universities. The greater emphasis on statistical mechanics makes PHYS 3103 a useful
prerequisite for this course, though this requirement may be relaxed at the instructor’s discretion.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No _____

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
   for:
   Proposed Course fee(s) per student, if different:
   for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   Non-licensure programs:
   Chemistry, B.S. major Chemistry emphasis
   Teacher Licensure programs: None
   Liberal Education: None

The above “service area” programs/departments were notified of this modification on 5/6/19 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.
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: **Mathematical Physics**
Proposed Course Title, if different:

Current Course Description:
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.

Proposed Course Description, if different:
Introduction to mathematical techniques used to solve problems in the physical sciences. Topics include complex numbers, Fourier series, ordinary and partial differential equations, and series solutions including Legendre polynomials and Bessel functions. Prerequisites: PHYS 2102, MATH 2472, or consent of instructor.

Current Credits: **3**
Proposed Credits, if different:

Current Prerequisite(s):
   Undergraduate: **MATH 2472 and PHYS 2102**
   Graduate:
Proposed Prerequisite(s), if different:
   Undergraduate: **PHYS 2102, MATH 2472, or consent of instructor**
   Graduate:

1) Reason(s) for change(s):

We have made a minor change to the list of topics covered in the course since this course will not have time to cover vector fields or complex analysis. Those topics will be covered in PHYS 4400 (which will now be called Mathematical Physics II).

The prerequisites of this course have been edited to allow the instructor to waive the requirement of completing PHYS 2102. This may allow motivated students to complete this course concurrently with PHYS 2102 if needed.
2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X___ No _____

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: 

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     - Teacher Licensure programs: None
     - Liberal Education: None

   The above “service area” programs/departments were notified of this modification on 5/6/19 (date) **in person.**

   Please check one of the items below:

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

   _____ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
  Undergraduate: **PHYS 3720**
  Graduate:
Proposed Course Number(s), if different:
  Undergraduate:
  Graduate:

Current Course Title: **Advanced Laboratory**
Proposed Course Title, if different:

Current Course Description:
A laboratory designed to supplement various pre-engineering and other advanced courses that currently have no laboratory component. Content varies with term, may be subtitled, and may be repeated. Prerequisite: PHYS 2102.

Proposed Course Description, if different:
A laboratory designed to supplement various advanced courses that currently have no laboratory component. Content varies with term and may be repeated. Prerequisite: PHYS 2102.

Current Credits: **1**
Proposed Credits, if different:

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

1) Reason(s) for change(s):

The description of the course has been changed to remove the outdated reference to pre-engineering.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No _____
3) Do these modifications change any of the following? **For all Yes answers, please provide updated information on the next page.**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Learning Outcomes</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Major Content Areas</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Projected Maximum Class Size (Cap)</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

4) Current Course fee(s) per student: $0 for:

   Proposed Course fee(s) per student, if different: Same for:

5) Service Areas:

   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
   - Teacher Licensure programs: None
   - Liberal Education: None

The above “service area” programs/departments were notified of this modification on **5/6/19 in person**.

Please check one of the items below:

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

   ______ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
   Undergraduate: **PHYS 4310**
   Graduate:
Proposed Course Number(s), if different:
   Undergraduate: **PHYS 4400**
   Graduate:

Current Course Title: **Mathematical Methods in Applied Physics**
Proposed Course Title, if different: **Mathematical Physics II**

Current Course Description:
Advanced topics in mathematical physics and engineering, including vector calculus, partial differential equations, Sturm-Liouville theory of orthogonal functions, and eigenfunction expansions. Prerequisite: PHYS 2102, and MATH 2490 or PHYS 3400. (Might not be offered every year.)

Proposed Course Description, if different:
Advanced topics in mathematical physics, including vector and tensor analysis, calculus of variations, Sturm-Liouville theory of orthogonal functions, complex residues, and Green functions. Prerequisite: PHYS 2102, PHYS 3400.

Current Credits: 3
Proposed Credits, if different:

Current Prerequisite(s): **PHYS 2102, and MATH 2490 or PHYS 3400**
   Undergraduate:
   Graduate:
Proposed Prerequisite(s), if different: **PHYS 2102, PHYS 3400**
   Undergraduate:
   Graduate:

1) Reason(s) for change(s):

This course will build on the concepts covered in PHYS 3400. The change in title, number, and prerequisites are designed to make the purpose of this course clearer to our students. The new course description now includes some topics that did not fit in PHYS 3400. This course is not intended to be part of a required or recommended sequence with PHYS 3400.
2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X___ No _____

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
   for:
   Proposed Course fee(s) per student, if different: Same
   for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     - Teacher Licensure programs: None
   - Liberal Education: None
   - Prerequisite for:
     - PHYS 4540 Electromagnetic Fields and Waves (changing to 4500)
     - PHYS 4610 Quantum Mechanics (changing to 4700)
     - PHYS 4680 Theoretical Physics (changing to 4800)

The above “service area” programs/departments were notified of this modification on **5/6/19 in person.**

Please check one of the items below:

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

______ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
  Undergraduate: PHYS 4540
  Graduate:
Proposed Course Number(s), if different:
  Undergraduate: PHYS 4500
  Graduate:

Current Course Title: Electromagnetic Fields and Waves
Proposed Course Title, if different: Electromagnetism

Current Course Description:
A study of applied electromagnetics. Topics include Maxwell's Equations boundary value problems, static fields, media, waves, waveguides, and antennas. Prerequisites: PHYS 2102, MATH 2490 (or PHYS 3400), PHYS 3103, and PHYS 4310 (or consent of instructor). (Might not be offered every year.)

Proposed Course Description, if different:
Classical theory of electric and magnetic fields. Topics include Maxwell's equations, boundary value problems, static fields, dielectric materials, waves, waveguides, and antennas. Prerequisites: PHYS 2102, PHYS 3400, or consent of instructor.

Current Credits: 4
Proposed Credits, if different:

Current Prerequisite(s): PHYS 2102, MATH 2490 (or PHYS 3400), PHYS 3103, and PHYS 4310 (or consent of instructor)
  Undergraduate:
  Graduate:
Proposed Prerequisite(s), if different: PHYS 2102, PHYS 3400, or consent of instructor
  Undergraduate:
  Graduate:

1) Reason(s) for change(s):

The prerequisites have been edited to allow students to take this course before completing PHYS 3103 or PHYS 4310, which should increase the number of potential students for the course. Minor edits were also made to the title, course number, and description of the course to improve clarity.
2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No _____

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 for:
   Proposed Course fee(s) per student, if different:
   for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     - Teacher Licensure programs: None
   - Liberal Education: None
   - Prerequisite for:
     - PHYS 4680 Theoretical Physics (changing to 4800)

The above “service area” programs/departments were notified of this modification on **5/6/19 in person.**

Please check one of the items below:

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

______ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
   Undergraduate: PHYS 4580
   Graduate:
Proposed Course Number(s), if different:
   Undergraduate: PHYS 4300
   Graduate:

Current Course Title: Optics
Proposed Course Title, if different:

Current Course Description:
Geometrical and Physical Optics, including Fraunhofer and Fresnel diffraction, coherence, and holography. Fourier analysis is employed as needed. Lecture and laboratory. Prerequisites: PHYS 2102, and MATH 2490 or PHYS 3400. (Might not be offered every year.)

Proposed Course Description, if different:
Electromagnetic wave phenomena, including Fraunhofer and Fresnel diffraction, interference, coherence, dispersion, and polarization. Lecture and laboratory. Prerequisites: PHYS 2102, PHYS 3400 or MATH 2490, or consent of instructor.

Current Credits: 4
Proposed Credits, if different:

Current Prerequisite(s):
   Undergraduate: PHYS 2102, and MATH 2490 or PHYS 3400.
   Graduate:
Proposed Prerequisite(s), if different:
   Undergraduate: PHYS 2102, PHYS 3400 or MATH 2490, or consent of instructor.
   Graduate:

1) Reason(s) for change(s):  
This is a minor edit to the description of the course so that it better describes the topics covered. In addition, the prerequisites have been altered to allow students to enroll with the instructor’s consent.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No ______
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
   for:
   Proposed Course fee(s) per student, if different:
   for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   - Non-licensure programs:
     - Physics, minor
   - Teacher Licensure programs:
     - Science Education, B.S. major Physics Specialty
   - Liberal Education: None
   - Prerequisite for: N/A

The above “service area” programs/departments were notified of this modification on 5/6/19 (date) 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.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
Undergraduate: PHYS 4610
Graduate:
Proposed Course Number(s), if different:
Undergraduate: PHYS 4700
Graduate:

Current Course Title: Quantum Mechanics
Proposed Course Title, if different:

Current Course Description:
Development and formulation of quantum mechanics, with selected applications in spectroscopy, atomic/nuclear structure, lasers, solid state. Prerequisites: PHYS 2102, PHYS 3103, MATH 2490 or PHYS 3400, and PHYS 4310. (Might not be offered every year.)

Proposed Course Description, if different:
Development and formulation of quantum mechanics, with selected applications in spectroscopy, atomic/nuclear structure, and lasers. Prerequisites: PHYS 3103, PHYS 3400.

Current Credits: 3
Proposed Credits, if different:

Current Prerequisite(s):
Undergraduate: PHYS 2102, PHYS 3103, MATH 2490 or PHYS 3400, and PHYS 4310.
Graduate:
Proposed Prerequisite(s), if different:
Undergraduate: PHYS 3103, PHYS 3400
Graduate:

1) Reason(s) for change(s):

Students who have successfully completed PHYS 3103 and PHYS 3400 should be sufficiently prepared to take this course. No other prerequisites are necessary. The course number and description have been changed slightly to improve clarity.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes __X__ No ______
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
for:
Proposed Course fee(s) per student, if different: Same
for:

5) Service Areas:
This course is a requirement or an elective in the programs/areas listed below.

Non-licensure programs:

Teacher Licensure programs:
None

Liberal Education:
None

Prerequisite for:
- PHYS 4660 Solid State Physics (changing to 4100)
- PHYS 4680 Theoretical Physics (changing to 4800)

The above “service area” programs/departments were notified of this modification on 5/6/19 (date) in person.

Please check one of the items below:

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

_______ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
   Undergraduate: PHYS 4660
   Graduate:
Proposed Course Number(s), if different:
   Undergraduate: PHYS 4100
   Graduate:

Current Course Title: Solid State Physics
Proposed Course Title, if different: Solid-State Physics

Current Course Description:
Fundamentals of condensed matter physics, emphasizing crystalline solids. Includes transport mechanisms, band theory, semiconductors, lasers. Prerequisites: PHYS 2102, MATH 2472, and PHYS 3103. PHYS 4610 is strongly recommended. (Might not be offered every year.)

Proposed Course Description, if different:
Fundamentals of condensed matter physics, emphasizing crystalline solids. Includes transport mechanisms, band theory, lattice vibrations, insulators and semiconductors. Prerequisites: PHYS 2102, PHYS 3103, MATH 2472.

Current Credits: 3
Proposed Credits, if different:

Current Prerequisite(s):
   Undergraduate: PHYS 2102, MATH 2472, and PHYS 3103. PHYS 4610 is strongly recommended.
   Graduate:
Proposed Prerequisite(s), if different:
   Undergraduate: PHYS 2102, PHYS 3103, MATH 2472.
   Graduate:

1) Reason(s) for change(s):

Since PHYS 4610 is not offered by our department very often, it is no longer strongly recommended as a prerequisite for this course. Also, the course number and description have been changed to improve clarity.
2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__  No ______

3) Do these modifications change any of the following?  **For all Yes answers, please provide updated information on the next page.**
   
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Yes _____ No <strong>X</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Content Areas</td>
<td>Yes _____ No <strong>X</strong></td>
</tr>
<tr>
<td>Projected Maximum Class Size (Cap)</td>
<td>Yes _____ No <strong>X</strong></td>
</tr>
</tbody>
</table>

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

5) Service Areas:
   
   This course is a requirement or an elective in the programs/areas listed below.
   
   Non-licensure programs:
   
   Teacher Licensure programs:
   
   None
   
   Liberal Education:
   
   None
   
   Prerequisites for: N/A

   The above “service area” programs/departments were notified of this modification on **5/6/19 in person.**

   Please check one of the items below:

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

   ______  Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
  Undergraduate: PHYS 4680
  Graduate:
Proposed Course Number(s), if different:
  Undergraduate: PHYS 4800
  Graduate:

Current Course Title: Theoretical Physics
Proposed Course Title, if different: Special Topics in Theoretical Physics

Current Course Description:
Advanced topics in electromagnetism, classical mechanics, and quantum mechanics.
Prerequisites: PHYS 2220, PHYS 4310, PHYS 4540, and PHYS 4610. (Might not be offered every year.)

Proposed Course Description, if different:
Advanced topics in electromagnetism, classical mechanics, and quantum mechanics.
Prerequisites: PHYS 3103, PHYS 3400, and consent of instructor.

Current Credits: 4
Proposed Credits, if different: 3

Current Prerequisite(s):
  Undergraduate: PHYS 2220, PHYS 4310, PHYS 4540, and PHYS 4610.
  Graduate:
Proposed Prerequisite(s), if different:
  Undergraduate: PHYS 3103, PHYS 3400, and consent of instructor.
  Graduate:

1) Reason(s) for change(s):

This course will function as a special topics course for physics minors. Since the topic of this course varies, the prerequisites may also vary, though PHYS 3103 and PHYS 3400 will always be required. Other requirements are at the discretion of the instructor. The number of credits have been decreased to three so that potentially more students will be able to fit this course into their schedule. The course title and number have been modified slightly to improve clarity.

2) May this modified course replace the current course for students remaining in the old curriculum? Yes ___X__ No ______

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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 for:
   Proposed Course fee(s) per student, if different: for:

5) Service Areas:
   This course is a requirement or an elective in the programs/areas listed below.
   Non-licensure programs:

   Teacher Licensure programs:
   None

   Liberal Education:
   None

   Prerequisites for: N/A

The above “service area” programs/departments were notified of this modification on 5/6/19 (date) by email.

Please check one of the items below:

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

   ______ Comments were received within one week of the notification, and are attached.
BSU Curriculum Forms

Form 3
Updated: 9.19.15

New Course Form

Course Number:
Undergraduate: PHYS 3700
Graduate:

Course Title: Classical Mechanics

Course Description:

Newton’s laws applied to systems of particles and rigid bodies. Topics includes energy and momentum conservation, non-inertial reference frames, Lagrangian and Hamiltonian mechanics. Prerequisites: PHYS 2101, PHYS 3400 or MATH 2490.

Credits: 3

Prerequisite(s):
Undergraduate: PHYS 2101, PHYS 3400 or MATH 2490
Graduate:

1. Reason(s) for creating this course:
   This course consists of an upper-division treatment of classical mechanics using advanced mathematical techniques. This fills a gap in our physics curriculum, as most physics programs around the country offer upper-division courses on classical mechanics. This course will be of interest to physics minors and other students who wish to deepen their understanding of Newton’s laws, momentum, energy, and other physics concepts.

2. How often will this course be offered?
   We anticipate that this course will be offered once every 2-3 years.

3. What are the student learning outcomes for the course?
   - Students will use Newtonian mechanics with forces and torques to analyze physical systems in Cartesian and curvilinear coordinates.
   - Students will solve mechanics problems using the work-energy principle and conservation of energy, momentum and angular momentum.
   - Students will solve and analyze rigid-body problems and problems in non-inertial frames.
   - Students will use Lagrangian and Hamiltonian mechanics to obtain the equations of motion for a variety of physical systems.

4. What are the major content areas for the course?
   - Mechanics
• Momentum
• Energy and Work
• Oscillatory Motion

5. Is this course repeatable for credit, and if so, what is the maximum number of credits that can be earned?
   No

6. If this course is intended primarily for off-campus delivery (not offered on campus), what delivery mechanism will be used?
   On-campus delivery only

7. What is the projected maximum class size (cap)?
   30

8. What qualified faculty will be available to teach this course?
   Dr. Sayer will be available to teach this course once every 2-3 years. Dr. Truedson is also qualified to teach this course if he is available.

NOTE WELL: Department and dean, in approving this proposal, attest both to the adequacy of the qualifications of faculty here named, and to their availability to teach the course at the frequency specified above, without excessive overload or disruption to other curriculum.

9. What additional library and other resources need or should be provided for this course, that are not already available?
   None

10. What special personal property or service fee(s) would be charged to students taking this course?
    None

11. Attach a sample syllabus for the course. Note: if this course is double-numbered (u-grad/grad), the syllabus must include an additional component for graduate students.
Bemidji State University
PHYS 3700: Classical Mechanics
3 Credits

Contact Information:
Instructor: Ryan Sayer
Office: S307
Office Hours: MWHF 10 a.m. – 12 p.m.
Telephone: (218) 755-2781
E-mail: Ryan.Sayer@bemidjistate.edu

Course Description:
Newton’s laws applied to systems of particles and rigid bodies. Topics include energy and momentum conservation, non-inertial reference frames, Lagrangian and Hamiltonian mechanics.

Prerequisites/Co-Requisites:
PHYS 2101, PHYS 3400 or MATH 2490

Textbooks/Materials:

Learning Outcomes:
• Students will use Newtonian mechanics with forces and torques to analyze physical systems in Cartesian and curvilinear coordinates.
• Students will solve mechanics problems using the work-energy principle and conservation of energy, momentum and angular momentum.
• Students will solve and analyze rigid-body problems and problems in non-inertial frames.
• Students will use Lagrangian and Hamiltonian mechanics to obtain the equations of motion for a variety of physical systems.

Grades:
Grades will be determined using the following weights:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Responses</td>
<td>10%</td>
</tr>
<tr>
<td>Attendance &amp; Participation</td>
<td>5%</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>35%</td>
</tr>
<tr>
<td>Midterm Exams (3)</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
</tbody>
</table>

Reading Responses (10%):
You are expected to familiarize yourself with the concepts addressed in the textbook before we discuss them in class. Reading responses (one for each chapter) will be submitted on the course’s D2L page by 9 p.m. the evening before we begin discussing the chapter. Your responses should mention specific parts of the chapter you found challenging that you would like me to focus on in our lecture. Your reading feedback need not be very long (just a short paragraph will suffice), but it should demonstrate that you have really thought about what you read. Your submissions will be given partial credit if they are overly general.

Attendance & Participation (5%):
Participation points will be assigned based on class attendance and participation in class discussions.

Homework (35%):
Homework assignments will consist mostly of problems from the textbook. Assignments and their due dates will be posted on D2L. You are encouraged to work on homework with your classmates, though each student must submit their own work.

**Midterm Exams (30%):**
Three in-class midterm exams will be given during the semester. These exams will consist of free-response questions and will be similar to homework questions. You will be allowed to use a graphing calculator and a handwritten equation sheet.

You will be given the chance to recover up to 50% of the points lost on each exam by submitting written corrections within one week of receiving your graded exam. Corrections should consist of (1) an explanation of what you did wrong the first time, and (2) a complete, correct solution to the problem. More instructions on exam corrections will be given later.

**Final Exam (20%):**
The final exam will be given on Tuesday, May 9th at 8 a.m. in our usual classroom. It will be comprehensive and similar in format to the midterm exams. No corrections will be allowed on the final exam.

**Tentative Schedule:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Textbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16-1/18</td>
<td>Math review, coordinates</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>1/23-1/25</td>
<td>Projectile motion, charged particles</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>1/28-2/1</td>
<td>Momentum and angular momentum</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>2/4-2/8</td>
<td>Work and energy</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>2/11-2/13</td>
<td>Oscillations, Fourier series, Midterm 1</td>
<td>Chapter 5</td>
</tr>
<tr>
<td>2/18-2/22</td>
<td>Calculus of variations</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>2/25-3/1</td>
<td>Lagrange’s equations</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>3/4-3/8</td>
<td>Hamiltonian mechanics</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>3/11-3/15</td>
<td>Two-body central-force problems</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>3/18-3/22</td>
<td>Spring Break</td>
<td></td>
</tr>
<tr>
<td>4/1-4/5</td>
<td>Rotational motion of rigid bodies</td>
<td>Chapter 10</td>
</tr>
<tr>
<td>4/8-4/12</td>
<td>Coupled oscillators and normal modes</td>
<td>Chapter 11</td>
</tr>
<tr>
<td>4/15-4/19</td>
<td>Nonlinear mechanics and chaos</td>
<td>Chapter 12</td>
</tr>
<tr>
<td>4/22-4/26</td>
<td>Collision theory, Midterm 3</td>
<td>Chapter 14</td>
</tr>
<tr>
<td>4/29-5/1</td>
<td>Review for final</td>
<td></td>
</tr>
<tr>
<td>5/9</td>
<td>Final Exam</td>
<td></td>
</tr>
</tbody>
</table>

**Time expectations:**
This is a three-credit course, so students should expect to spend up to six hours a week on homework and studying outside of class.

**Academic Integrity:**
BSU students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Any form of academic dishonesty (e.g., plagiarism, cheating and misrepresentation) may result in disciplinary action. Possible disciplinary actions may include failure for part or an entire course as well as suspension from the University.

**Disruptive Behavior in the Classroom:**
We at Bemidji State University believe the classroom is an environment where civility, human dignity and respect is maintained. Any variation from this for example yelling or saying profanity at an instructor or another person in the
classroom, or any other loud, lewd, belligerent or obnoxious behavior resulting in a disruption from teaching, and learning are violations of the Code of Conduct and will not be tolerated. If this occurs, you will be asked to leave the classroom not to return until you meet with the University Conduct Officer and you could be subject to a judicial hearing.

Extended Leave Procedure:
If student has to be away from class from an extended period of time (more than two class sessions) for medical emergencies or a funeral, you are asked to contact the Student Life and Success Office where a leave notice will be given to your faculty. This leave does not absolve you from any assignment you have due during your leave. You are to make arrangements with your instructors of when to complete any assignments due during the leave period. You can complete a leave form at this website [https://www.bemidjistate.edu/offices/student-life-success/extended-absence/](https://www.bemidjistate.edu/offices/student-life-success/extended-absence/)

Students with Special Needs:
BSU is committed to making all educational programs, course materials, services and activities sponsored by the University accessible to individuals with disabilities. Students requesting accommodations due to a disability or other need for access should contact Accessibility Services as soon as possible. Accessibility Services is located at Decker Hall 202. PH: 218.755.3883 or email: accessibility@bemidjistate.edu. This information is also available through Minnesota Relay Services at 800.627.3529.

Mental Health and Counseling:
Students may experience mental health concerns or stressful events that may lead to diminished academic performance. The Student Center for Health & Counseling is available to assist you with concerns and can include stress relief services. They can be reached in Cedar Hall, First Floor. Phone: (218) 755-2053.

Accessibility statement:
Upon request this document can be made available in alternate formats. Please contact Accessibility Services at 755-3883.
BSU Curriculum Forms

Form 4

Course Drop Form
(Use this form to drop a course from the university curriculum file. To drop a course from a program only, use Form 5 Program Modification Form)

Course Number:
   Undergraduate: PHYS 1230
   Graduate:

Course Title: Introduction to Engineering

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
   1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
   2) click on “Areas of Study, and Course Descriptions,”
   3) click on “PDF of Entire Catalog” in upper right,
   4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs: None
   Teacher Licensure programs: None
   Liberal Education: None
   Prereq’s for: None

The above “service area” programs/departments were notified of this modification on ___5/6/19___ by ____email____.

Please check one of the items below:

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

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

Reason(s) for dropping this course:
This course was better suited for engineering physics majors before that program was eliminated, but it does not complement our current physics programs and is no longer of use to our students, so we do not plan to offer it again in the future.
BSU Curriculum Forms

Form 4

Course Drop Form
(Use this form to drop a course from the university curriculum file.
To drop a course from a program only, use Form 5 Program Modification Form)

Course Number:
   Undergraduate: PHYS 2150
   Graduate:

Course Title: Acquisition and Control with G Programming

New or current courses that will universally replace this dropped course for students
remaining in the old curriculum: None

This dropped 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:
   1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent
catalog(s),
   2) click on “Areas of Study, and Course Descriptions,”
   3) click on “PDF of Entire Catalog” in upper right,
   4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs: None
   Teacher Licensure programs: None
   Liberal Education: None
   Prereq’s for: None

The above “service area” programs/departments were notified of this modification
on ___5/6/19__ by _____email____.

Please check one of the items below:

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week of the notification.

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

Reason(s) for dropping this course:
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BSU Curriculum Forms

Form 4

Course Drop Form
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Course Number:
   Undergraduate: PHYS 3150
   Graduate:

Course Title: Circuit Analysis

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
   1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
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   3) click on “PDF of Entire Catalog” in upper right,
   4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs: None
   Teacher Licensure programs: None
   Liberal Education: None
   Prereq’s for: None

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BSU Curriculum Forms

Form 4

Course Drop Form
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Course Number:
   Undergraduate: PHYS 3230
   Graduate:

Course Title: Fluid Mechanics

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
   1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
   2) click on “Areas of Study, and Course Descriptions,”
   3) click on “PDF of Entire Catalog” in upper right,
   4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs: None
   Teacher Licensure programs: None
   Liberal Education: None
   Prereq’s for: None

The above “service area” programs/departments were notified of this modification on ___5/6/19__ by ____email____.

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Reason(s) for dropping this course:
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BSU Curriculum Forms

Form 4

Course Drop Form
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Course Number:
  Undergraduate: PHYS 3250
  Graduate:

Course Title: Acoustics and Vibrations

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped course is a requirement or an elective in the programs/areas listed below.
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  1) go to [http://www.bemidjistate.edu/academics/catalog/](http://www.bemidjistate.edu/academics/catalog/) and choose the most recent catalog(s),
  2) click on “Areas of Study, and Course Descriptions,”
  3) click on “PDF of Entire Catalog” in upper right,
  4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

  Non-licensure programs: None
  Teacher Licensure programs: None
  Liberal Education: None
  Prereq’s for: None

The above “service area” programs/departments were notified of this modification on ____5/6/19__ by ____email____.

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BSU Curriculum Forms

Form 4

Course Drop Form
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Course Number:
Undergraduate: PHYS 3270
Graduate:

Course Title: Systems and Controls

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
2) click on “Areas of Study, and Course Descriptions,“
3) click on “PDF of Entire Catalog” in upper right,
4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

Non-licensure programs: None
Teacher Licensure programs: None
Liberal Education: None
Prereq’s for: None

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Reason(s) for dropping this course:
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BSU Curriculum Forms

Form 4

Course Drop Form
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Course Number:
  Undergraduate: PHYS 3500
  Graduate:

Course Title: Electronics II

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
  1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
  2) click on “Areas of Study, and Course Descriptions,”
  3) click on “PDF of Entire Catalog” in upper right,
  4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

  Non-licensure programs: None
  Teacher Licensure programs: None
  Liberal Education: None
  Prereq’s for: None

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BSU Curriculum Forms

Form 4

Course Drop Form
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Course Number:
  Undergraduate: PHYS 4120
  Graduate:

Course Title: Engineering Simulation and Design

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
  1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
  2) click on “Areas of Study, and Course Descriptions,”
  3) click on “PDF of Entire Catalog” in upper right,
  4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

    Non-licensure programs: None
    Teacher Licensure programs: None
    Liberal Education: None
    Prereq’s for: None

The above “service area” programs/departments were notified of this modification on ___5/6/19__ by ____email____.

Please check one of the items below:

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Reason(s) for dropping this course:
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BSU Curriculum Forms

Form 4

Course Drop Form
(Use this form to drop a course from the university curriculum file. To drop a course from a program only, use Form 5 Program Modification Form)

Course Number:
   Undergraduate: PHYS 4720
   Graduate:

Course Title: Applied Controls

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
   1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
   2) click on “Areas of Study, and Course Descriptions,”
   3) click on “PDF of Entire Catalog” in upper right,
   4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs: None
   Teacher Licensure programs: None
   Liberal Education: None
   Prereq’s for: None

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BSU Curriculum Forms

Form 4

Course Drop Form
(Use this form to drop a course from the university curriculum file. To drop a course from a program only, use Form 5 Program Modification Form)

Course Number:
  Undergraduate: PHYS 4751
  Graduate:

Course Title: Engineering Design Project I

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

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  2) click on “Areas of Study, and Course Descriptions,”
  3) click on “PDF of Entire Catalog” in upper right,
  4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

  Non-licensure programs: None
  Teacher Licensure programs: None
  Liberal Education: None
  Prereq’s for: None

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Reason(s) for dropping this course:
This course was better suited for engineering physics majors before that program was eliminated, but it does not complement our current physics programs and is no longer of use to our students, so we do not plan to offer it again in the future.
BSU Curriculum Forms

Form 4

Course Drop Form
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Course Number:
   Undergraduate: PHYS 4752
   Graduate:

Course Title: Engineering Design Project II

New or current courses that will universally replace this dropped course for students remaining in the old curriculum: None

This dropped 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:
   1) go to http://www.bemidjistate.edu/academics/catalog/ and choose the most recent catalog(s),
   2) click on “Areas of Study, and Course Descriptions,“
   3) click on “PDF of Entire Catalog” in upper right,
   4) press Ctrl F, and enter the prefix and number of the course(s) from this form.

   Non-licensure programs: None
   Teacher Licensure programs: None
   Liberal Education: None
   Prereq’s for: None

The above “service area” programs/departments were notified of this modification on ___5/6/19___ by ____email____.

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BSU Curriculum Forms

Form 8
Updated: 09.18.15

Signatures

_Ryan Sayer / Assistant Professor of Physics / 5.7.19_________________________
Proposer / Title / Date

_John Truedson / Physics / 5.7.19________________________________________
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.

_Bonnie Higgins / Business, Mathematics and Sciences / 5.9.19_________________
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.
From: Wahl, Janine S <Janine.Wahl@bemidjistate.edu>
Sent: Monday, May 6, 2019 8:29 PM
To: Sayer, Ryan T <Ryan.Sayer@bemidjistate.edu>
Subject: Re: minor changes to some physics course descriptions

Hi Ryan,
Thanks for the email. We don't have any objections as a department as this is your area. Why we need to know of changes is so that we can make the changes in our state reporting.

Thanks so much for sending. If our research analyst who does our state reporting has any questions we will let you know!

Thank you!

Janine S. Wahl, Ed.D.
Department Chair
Professional Education Department
Bemidji State University
phone: 218-755-3772

From: Isaacson, Carl W <Carl.Isaacson@bemidjistate.edu>
Sent: Tuesday, May 7, 2019 8:03 AM
To: Sayer, Ryan T <Ryan.Sayer@bemidjistate.edu>
Cc: Kivi, Paul A <Paul.Kivi@bemidjistate.edu>; Rios-Sanchez, Miriam <Miriam.Rios-Sanchez@bemidjistate.edu>; Santos, Cornelia <Cornelia.Santos@bemidjistate.edu>; Sea, William B <William.Sea@bemidjistate.edu>; Carlson, Anna M <Anna.Carlson@bemidjistate.edu>
Subject: RE: minor changes to physics course descriptions

Ryan,

I don’t see anything that would cause Environmental Studies concern. I have cc’d my colleagues to see what they think.

Carl

From: White, Jim A <Jim.White@bemidjistate.edu>
Sent: Tuesday, May 7, 2019 10:33 AM
To: Sayer, Ryan T <Ryan.Sayer@bemidjistate.edu>
Subject: RE: minor changes to introductory physics course descriptions

Hi Ryan,

Thanks for the update. I see no problem with the changes being made.

Regards,

Jim

Jim White, Ph. D., C.S.C.S., ACSM-CCEP
Professor/Chair - Dept. of Human Performance, Sport and Health
From: Meulebroeck, Lyle R <Lyle.Meulebroeck@bemidjistate.edu>
Sent: Tuesday, May 7, 2019 10:48 AM
To: Sayer, Ryan T <Ryan.Sayer@bemidjistate.edu>
Subject: RE: minor change to introductory physics course descriptions

Hello Ryan,

I have forwarded your message to our faculty. We’ll let you know if we have any concerns.

Lyle

From: Marek, Keith A <KMarek@bemidjistate.edu>
Sent: Tuesday, May 7, 2019 10:55 AM
To: Sayer, Ryan T <Ryan.Sayer@bemidjistate.edu>
Subject: RE: minor changes to physics course descriptions

Ryan,

I am fine with these changes.

KAM

From: Marty J. Wolf <mjwolf@cs.bemidjistate.edu>
Sent: Wednesday, May 8, 2019 9:34 AM
To: Sayer, Ryan T <Ryan.Sayer@bemidjistate.edu>
Subject: Re: minor change to course PHYS 2500 Electronics I

Ryan,

We have no objections. March onward!

Regards,

MJ