Curriculum Proposal

PHYS 19-20 #34

Packet Contents

1.1 Summary

Course Modification

1.2 PHYS 6030 Electronics for Teachers (3 credits) to PHYS 6030 Survey of Electronics (3 credits); description change and prerequisite change

1.5 PHYS 6050 Modern Physics for Teachers (3 credits) to PHYS 6050 Modern Physics (3 credits); description change and prerequisite change

New Courses

1.10 PHYS 3300/5300 Thermal and Statistical Physics (3 credits)
NOTE: This new course only adds PHYS 5300 to curriculum as 3300 already exists.

1.15 PHYS 6040 Survey of Optics (3 credits)
Note: This course was end dated in curriculum in 2014. This proposal activates it again.

1.19 Signatures
BSU Curriculum Forms

Form 1

Curriculum Modification Summary

College: Business, Mathematics and Sciences
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:

We are creating two new graduate-level courses to be delivered online as part of the MinnState Concurrent Enrollment Consortium. We are also modifying the names and description of two courses that are already in the catalog to match their intended purpose.

Modifications proposed (specify number of each):
__2__ Course Modification(s) (form 2)
__2__ New Course(s) (form 3)
____ Course Drop(s) (form 4)
____ Program Modification(s) (form 5)
____ New Program(s) (form 6)
____ Program Drop(s) (form 7)

The modifications affect (check):
_____ Liberal Education
_____ Undergraduate Curriculum
_x_ Graduate Curriculum
_____ Teacher Licensure Program(s)
BSU Curriculum Forms

Form 2
Updated 9.19.15

Course Modification Form

Current Course Number(s):
   Undergraduate:
   Graduate: PHYS 6030
Proposed Course Number(s), if different:
   Undergraduate:
   Graduate:

Current Course Title: Electronics for Teachers
Proposed Course Title, if different: Survey of Electronics

Current Course Description:
For science and mathematics teachers licensed in Minnesota to upgrade their licensures to teach physics. The instructional format is hands-on lab-based, with students creating and analyzing breadboard circuits and the instructor providing explanations of technique and theory on an as-needed basis. Covers a broad survey of practical topics, with students wiring up several common circuits of practical usefulness as well as relevance in the high school classroom. Prerequisites: One year of introductory physics and Minnesota teaching license in science or mathematics.

Proposed Course Description, if different:
A broad survey of the principles of electronics. Topics include series and parallel circuits, Kirchhoff’s rules, capacitors and inductors, and digital ICs. Prerequisites: Licensed Physics Teacher or B.S. Degree in Physics.

Current Credits: 3
Proposed Credits, if different: same

Current Prerequisite(s):
   Undergraduate:
   Graduate: One year of introductory physics and Minnesota teaching license in science or mathematics.
Proposed Prerequisite(s), if different:
   Undergraduate:
   Graduate: Licensed Physics Teacher or B.S. Degree in Physics

1) Reason(s) for change(s):
We are modifying the names and description of two courses that are already in the physics graduate catalog to reflect their more general purposes.
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 __X___ No ______
   Major Content Areas        Yes __X___ No ______
   Projected Maximum Class Size (Cap) Yes ______ No __X__

Current SLO’s: none
Proposed:
- create and analyze breadboard circuits
- examine digital ICs
- survey the principles of electronics
- determine how to implement Kirchhoff’s rules in series and parallel circuits

Current major content areas: none
Proposed:
- series and parallel circuits
- Kirchhoff’s rules
- Capacitors
- inductors
- digital ICs

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. 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:
   - N/A
   Teacher Licensure programs:
   - N/A
   Liberal Education:
   - N/A
The above “service area” programs/departments were notified of this modification on _______ (date) by __________________ (mail, email, or phone).

Please check one of the items below:

___X___ No comments were received from other programs or departments within one week of the notification. (N/A – no affected programs)

______ 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: 
  Graduate: PHYS 6050
Proposed Course Number(s), if different:
  Undergraduate:  
  Graduate: same

Current Course Title: Modern Physics for Teachers
Proposed Course Title, if different: Modern Physics

Current Course Description:
For science and mathematics teachers licensed in Minnesota to upgrade their licenses to teach physics. An introduction to modern physics (1900 to present). Prerequisites: One year of introductory physics and Minnesota teaching license in science or mathematics.

Proposed Course Description, if different:
A qualitative and quantitative overview of physics developments in the 20th century, with an emphasis on special relativity and quantum mechanics. Topics include Lorentz transformations, space-time intervals, relativistic energy and momentum, the Heisenberg uncertainty principle, and solutions to Schrödinger’s wave equation involving free particles, quantum harmonic oscillators, and the hydrogen atom. Prerequisites: Licensed Physics Teacher or B.S. Degree in Physics.

Current Credits: 3
Proposed Credits, if different: same

Current Prerequisite(s):
  Undergraduate:  
  Graduate: One year of introductory physics and Minnesota teaching license in science or mathematics.
Proposed Prerequisite(s), if different:
  Undergraduate:  
  Graduate: Licensed Physics Teacher or B.S. Degree in Physics

1) Reason(s) for change(s):
We are modifying the names and description of two courses that are already in the graduate catalog to reflect their more general purposes.
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.**

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

Current Student Learning Outcomes: None
Proposed:
- Perform calculations and solve equations involving relativistic or quantum-mechanical systems.
- Integrate quantum mechanical wave functions and determine expectation values of physical observables.
- Examine the principles of modern physics and elaborate on those principles in a written research paper.
- Evaluate the moral and ethical factors involved in the physics advancements of the 20th century.

Current Major Content Areas: None
Proposed:
- Quantum mechanics
- Special Relativity
- Energy
- Wave functions
- Atoms

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. To locate where this course appears please search the online catalog, as follows:
   a) go to 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.
      - N/A
      Teacher Licensure programs:
      - N/A
      Liberal Education:
      - N/A
The above “service area” programs/departments were notified of this modification on ________ (date) by ____________________ (mail, email, or phone).

Please check one of the items below:

___X__  No comments were received from other programs or departments within one week of the notification. (N/A – no affected programs)

______ Comments were received within one week of the notification, and are attached.
**Phys 6050: Modern Physics**

3 semester credits

Instructor: Dr. Ryan Sayer

Office: S215A
E-mail: Ryan.Sayer@bemidjistate.edu
Phone: (218) 755-2781
Office hours: M Tu F 10 a.m. – 1 p.m.
Th 10 a.m. – 11 a.m.

Lectures: TBA
Labs: TBA

**Textbooks (required):**
*Introduction to Quantum Mechanics, 3e, David Griffiths*

*The Feynman Lectures on Physics* (available for free online)

**Course Description:**

This course provides a brief qualitative and quantitative description of 20th century physics ("modern physics") concepts, with an emphasis on special relativity and quantum mechanics. Topics covered include Lorentz transformations, space-time intervals, energy-mass relation, wave-particle duality, and solutions to Schrödinger’s equation involving free particles, infinite square wells, simple harmonic oscillators, and the hydrogen atom.

**Learning Objectives:**

After completing this course, students should be able to:

1. Perform calculations and solve equations involving relativistic or quantum-mechanical systems.
2. Examine the principles of modern physics and elaborate on those principles in a written research paper.
3. Integrate quantum mechanical wave functions and determine expectation values of physical observables.
4. Evaluate the moral and ethical factors involved in the physics advancements of the 20th century.

<table>
<thead>
<tr>
<th>Grade Weighting:</th>
<th>Homework Assignments</th>
<th>20%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Term Paper</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Labs</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Exams (3)</td>
<td>45%</td>
</tr>
<tr>
<td></td>
<td>Final Exam</td>
<td>15%</td>
</tr>
</tbody>
</table>

| Grade Assignments: | |
|--------------------| | 100%-90% | A |
|                    | 90%-78% | B |
|                    | 78%-62% | C |
|                    | 62%-50% | D |
|                    | Below 50% | F |

**University Policies:**

- Students at Bemidji State University 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, which could include failure for part of or all of the course and possibly suspension from the University.

- If you need 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, through which a leave notice will be given to your faculty. This notice informs the faculty of your departure and return date back to campus. This leave does not absolve you from any assignments you have due during your leave. Please make arrangements with your instructor to complete any assignments due during the leave period. You can complete a leave form at https://www.bemidjistate.edu/offices/student-life-success/extended-absence/.

- Upon request, this syllabus may be made available in alternate formats. If you would like to request accommodations or other services, please contact Disability Services, Decker Hall 202. Phone: (218) 755-3883, accessibility@bemidjistate.edu. Also available through the Minnesota Relay Service at 1-800-627-3529.
BSU Curriculum Forms

Form 3
Updated: 9.19.15

New Course Form

Course Number:
Undergraduate: PHYS 3300 already exists
Graduate: PHYS 5300

Course Title: Thermal and Statistical Physics

Course Description:
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.

Credits: 3

Prerequisite(s):
Undergraduate: PHYS 2102, PHYS 3103, MATH 2472, or consent of instructor.
Graduate: Licensed Physics Teacher or B.S. Degree in Physics

1. Reason(s) for creating this course:
This course will be delivered online as part of the MinnState Concurrent Enrollment Consortium. It will help physics teachers in the MinnState to satisfy a requirement of graduate-level coursework.

2. How often will this course be offered?
It will be offered on alternate years or as requested.

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?
By completing this course, students will:
• demonstrate a mastery of the core knowledge base expected of physics professionals in areas of thermal physics.
• evaluate their knowledge-based competencies in the fields of thermodynamics & statistical mechanics.
• create and develop quantitative, analytical and problem-solving skills at a level appropriate for undergraduate/graduate coursework.

4. What are the major content areas for the course?
Thermodynamics, statistical mechanics, heat, entropy, temperature, engines, phase change
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?
Online

7. What is the projected maximum class size (cap)?
25 for a graduate level course

8. What qualified faculty will be available to teach this course?
Ryan Sayer, John Truedson

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? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
Amount per student: $ 0
For:

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.
PHYS 3300/5300: Thermal and Statistical Physics  
Course Syllabus

3 semester credits

Instructor: Ryan Sayer  
E-mail: Ryan.Sayer@bemidjistate.edu  
Office: S215A  
Office hours: M-F 10:00 – 12:00  
Class meets: TBA

Textbook (required):  
Fundamentals of Statistical and Thermal Physics, F. Reif (Waveland Press, 2009)

Prerequisites:
Licensed physics teacher or B.S. degree in physics

Course Description:
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.

Thermal Physics deals with collections of large numbers (~ $10^{23}$) of constituents, be they electrons, photons, atoms, gas or liquid molecules, and so on. This is a tall order, and yet you will see by the end of the semester that the simple tools you acquired allow you to predict the behavior of a staggering variety of physics systems ranging from droplets of liquid helium to cellular metabolism to black holes. You will quickly find out that there are, broadly, two powerful perspectives on thermal physics:

**Thermodynamics:** Sometimes you will find that the properties of matter do not necessarily depend on the microscopic details of the atoms, molecules, etc. Heat always flows from hot to cold. Any heat engine has the same upper limit to its efficiency. Thermodynamics provides a phenomenological description of such systems in terms of a small number of experimentally measurable parameters. Equipped with the four basic laws of thermodynamic, you will never be fooled by a hack trying to sell you a perpetual motion machine.

**Statistical Mechanics:** Thermodynamics is great, but why does heat always flow from hot to cold? What is it about dilute gases that make them behave according to the ideal gas law? What does entropy actually mean? To answer such questions we need to look at the behavior of individual constituents. To actually dig deeper and answer these questions, Statistical Mechanics takes into account the classical or quantum behavior of individual particles and uses statistics to make the connection from a few particles to ~$10^{23}$ particles. Sometimes this will be hard to do. Sometimes you will be astonished by how simple it will be.

Learning Objectives:
By completing this course, students will:

- demonstrate a mastery of the core knowledge base expected of physics professionals in areas of thermal physics.
• evaluate their knowledge-based competencies in the fields of thermodynamics & statistical mechanics.
• create and develop quantitative, analytical and problem-solving skills at a level appropriate for undergraduate/graduate coursework.

Graduate Students:
In addition to other assignments, graduate students taking this course will:
• Complete additional advanced problems as assigned from the textbook
• Complete additional assignments covering the following sections of the textbook in greater detail:
  o Elementary Kinetic Theory of Transport Processes
  o Debye Theory of Solids
  o Irreversible Processes and Fluctuations

<table>
<thead>
<tr>
<th>Grade weighting:</th>
<th>Reading Responses</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Homework:</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>Participation/Presentation</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Mid-term Exam:</td>
<td>20%</td>
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<tr>
<td></td>
<td>Final Exam:</td>
<td>20%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Letter grade assignments:</th>
<th>100%-90%</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90%-78%</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>78%-62%</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>62%-50%</td>
<td>D</td>
</tr>
</tbody>
</table>

Reading Responses:
You are expected to familiarize yourself with the concepts addressed in the textbook before we discuss them in class. Reading responses (one for each lecture) will be submitted on the course’s D2L page by Friday at noon. Your responses should mention specific parts of the reading you found challenging that you would like me to focus on in our lecture. Your reading feedback need not be very long (just a few sentences will do), 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.

Homework:
Weekly homework assignments will consist of problems from the textbook sections covered in class. Assignments will be posted on D2L shortly after lectures and will be due at the start of the next week’s lecture. You are encouraged to work on homework with your classmates, though each student must submit their own work.

Participation/Presentation:
Participation points will be assigned based on class attendance and participation in class discussions. At some point during the semester, each student will have the opportunity to lead the class discussion for one lecture period (50 minutes). Signup for choice of topic will be on a first-come, first-served basis.
Midterm and Final Exams:
One midterm exam and one final exam will be given during the semester. These exams will consist of several free-response questions (similar to homework questions).

Academic Integrity Policy:
Students at Bemidji State University 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, which could include failure for part of or all of the course and possibly suspension from the University.

Accessibility:
Upon request this document can be made available in alternate formats. I want to make sure that all the materials, discussions, and activities that are part of the course are accessible to everyone. If you would like to request accommodations or other services, please contact Accessibility Services, Decker Hall 202. Phone: (218) 755-3883, accessibility@bemidjistate.edu Also available through the Minnesota Relay Service at 1-800-627-3529.

Class Schedule (subject to change):

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/12</td>
<td>Introduction, heat and work</td>
<td>1.1 – 1.5</td>
</tr>
<tr>
<td>1/19</td>
<td>Heat capacities, rates of processes</td>
<td>1.6 – 1.7</td>
</tr>
<tr>
<td>1/26</td>
<td>2nd law of thermodynamics, large systems</td>
<td>2.1 – 2.4</td>
</tr>
<tr>
<td>2/2</td>
<td>Entropy of ideal gases</td>
<td>2.5 – 2.6</td>
</tr>
<tr>
<td>2/9</td>
<td>Temperature and entropy</td>
<td>3.1 – 3.3</td>
</tr>
<tr>
<td>2/16</td>
<td>Equilibrium, pressure, and chemical potential</td>
<td>3.4 – 3.6</td>
</tr>
<tr>
<td>2/23</td>
<td>Engines and refrigerators</td>
<td>4.1 – 4.4</td>
</tr>
<tr>
<td></td>
<td>Midterm Exam (Chapters 1-4)</td>
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</tr>
<tr>
<td>3/2</td>
<td>Free energies</td>
<td>5.1 – 5.2</td>
</tr>
<tr>
<td>3/9</td>
<td>Phase transitions</td>
<td>5.3 – 5.4</td>
</tr>
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<td>3/16</td>
<td>SPRING BREAK (NO CLASS)</td>
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<tr>
<td>3/23</td>
<td>Boltzmann statistics</td>
<td>6.1 – 6.3</td>
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<td>3/30</td>
<td>Maxwell distribution, partition functions</td>
<td>6.4 – 6.6</td>
</tr>
<tr>
<td>4/6</td>
<td>Ideal gas partition functions, Gibbs factor</td>
<td>6.7 – 7.1</td>
</tr>
<tr>
<td>4/13</td>
<td>Bose-Einstein distribution, Fermi gases</td>
<td>7.2 – 7.3</td>
</tr>
<tr>
<td>4/20</td>
<td>Planck distribution, Debye theory, BEC</td>
<td>7.4 – 7.6</td>
</tr>
<tr>
<td>TBA</td>
<td>Final Review session</td>
<td></td>
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</tbody>
</table>
BSU Curriculum Forms

Form 3
Updated: 9.19.15

New Course Form

Course Number:
   Undergraduate:
   Graduate: PHYS 6040 (Course was end dated in 2014, this is same course so using the same number)

Old Course Title: Optics for Teachers
New Course Title: Survey of Optics

Old Course Description:
For science and mathematics teachers licensed in Minnesota to upgrade their licensures to teach physics. An introduction to modern optics with emphasis on geometric optics. Wave optics is introduced sufficiently to enable interpretation of diffraction, interference, and laser effects. Prerequisites: One year of introductory physics and Minnesota teaching license in science or mathematics.

New Course Description:
An introduction to modern optics, with emphasis on geometric optics. Wave optics will be introduced sufficiently to enable interpretation of diffraction, interference, and laser effects. Prerequisites: Licensed Physics Teacher or B.S. Degree in Physics.

Credits: 3

Prerequisite(s):
   Undergraduate:
   Graduate: Licensed Physics Teacher or B.S. Degree in Physics

1. Reason(s) for creating this course:
This course will be delivered online as part of the MinnState Concurrent Enrollment Consortium. It will help physics teachers in the MinnState to satisfy a requirement of graduate-level coursework.

2. How often will this course be offered?
   It will be offered on alternate years or as requested.

3. What are the student learning outcomes for the course (please precede each outcome with "Students will...")?
   On completion of this course, students will be able to:
   • classify the propagation of light in conducting and non-conducting media;
   • survey the physics governing laser behavior and light matter interaction;
• synthesize the principles of wave optics and diffraction theory and apply them to a range of quantitative and qualitative problems;
• test and communicate ideas and explanations at a level of sophistication appropriate for graduate coursework using tools, methodologies, language and conventions of physics.

4. What are the major content areas for the course?
ray optics, wave optics, reflection, refraction, diffraction, photons, lasers

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?
Online delivery

7. What is the projected maximum class size (cap)?
25

8. What qualified faculty will be available to teach this course?
John Truedson, Ryan Sayer

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? These charges would be for 1) items that are retained by the student and have an educational or personal value beyond the classroom, or 2) services that are on the student’s behalf (see MnSCU Board Policy 5.11).
   Amount per student: $0
   For:

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.
Physics 6040: Survey of Optics, 3 credits, Fall 2020
Dr. John Truedson
jtruedson@bemidjistate.edu
755-2796

Text: Optics 5th ed., Eugene Hecht
Updated: September 30, 2019

This course is an introduction to Modern Optics with emphasis on geometric optics. Wave optics will be introduced sufficiently to enable interpretation of diffraction, interference, and laser effects.
Course prerequisites: Licensed Physics Teacher or B.S. Degree in Physics

Topics to be covered in the course:

Chapter 1 A brief History
Chapter 2: Wave Motion
Chapter 3: Electromagnetic Theory, Photons, and Light
Exam 1 on Chapters 1, 2 and 3

Chapter 4: The Propagation of Light
Chapter 5: Geometrical Optics
Exam 2 on Chapters 4 and 5

Chapter 8: Polarization
Chapter 9: Interference
Exam 3 on Chapters 8 and 9

Chapter 10: Diffraction
Chapter 13: Modern optics and Lasers
Exam 4 on Chapter 10 and 13

Pre-test: There will be a 50 question multiple choice exam prior to completing the rest of the course. The score for the exam will only be used for assessment purposes and will not count towards the overall grade of the class. You will be allowed to take the exam twice.

Chapter Exams: The exams will be based on the questions and problems assigned for each chapter. The exams will be multiple choice and short answer. You will be allowed to use any reference materials for the exam. You will be allowed to take part each test twice with the highest score being recorded.

Internet Assignments: These assignments will utilize many of the optics-related sites available on the World Wide Web. There will be 8 assignments during the semester. I will direct you to a specific Internet URL in order to complete the assignment. You can
submit assignments either with the D2L software or via E-mail.

**Discussions:** There will be a link for discussions. I will post 7 topics (almost 1 for each chapter) during the semester to which you can respond. You will be required to participate at least twice (2) in all 7 posted discussions for a minimum of 14 total postings to receive full credit. The comments can be as short as a few sentences or as long as you wish. I encourage active participation in discussions.

**Term Paper:** There will be a 3 – 4 page term paper for the course. The focus of the paper will be about either a real-world application of modern optics or an original classroom activity demonstrating optics principles. You will need to include all references at the end of the paper. Papers will be submitted electronically and then posted on the course web site.

An optics laboratory exercise series also will be scheduled during Summer 2020 as part of the Optics course (currently planned for July 9–27, 2020). Details about the lab will be discussed later. Optics lab experiments to be covered are:

1. Reflection: Plane and Curved Mirrors
2. Refraction; Prisms, Dispersion and Total Internal Reflection
3. Thin Lens Ray Optics: Focal Length and Magnification
4. Telescopes and Microscopes
5. Polarization: the Faraday Effect
6. Grating and Single-slit Diffraction; Double-Slit Interference

**Grades:** Grades will be awarded as follows, based on assignments turned in by the above date:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of pre-test</td>
<td>5%</td>
</tr>
<tr>
<td>4 exams</td>
<td>40%</td>
</tr>
<tr>
<td>Discussion and Internet quizzes</td>
<td>25%</td>
</tr>
<tr>
<td>Term paper</td>
<td>10%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Total:** 100%

**Accessibility:**

Upon request this document can be made available in alternate formats. I want to make sure that all the materials, discussions, and activities that are part of the course are accessible to everyone. If you would like to request accommodations or other services, please contact Accessibility Services, Decker Hall 202. Phone: (218) 755-3883, accessibility@bemidjistate.edu Also available through the Minnesota Relay Service at 1-800-627-3529.
BSU Curriculum Forms

Form 8
Updated: 09.18.15

Signatures

Ryan Sayer / Assistant Professor of Physics / 12.06.2019
Proposer / Title / Date

John Truedson / Physics / 12.06.2019
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.

Marilyn Yoder / Business, Mathematics and Sciences / 12.09.2019
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.