### I. ASCRC General Education Form

<table>
<thead>
<tr>
<th>Group</th>
<th>XI Natural Sciences</th>
<th>Dept/Program</th>
<th>Physics &amp; Astronomy</th>
<th>Course #</th>
<th>PHYS U 212N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Title</td>
<td>Fundamentals of Physics with Calculus II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prerequisite</td>
<td>PHYS 211, MATH 153 (coreq), PHYS 214 (coreq)</td>
<td>Credits</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### II. Endorsement/Approvals

Complete the form and obtain signatures before submitting to Faculty Senate Office

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Andrew Ware</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone / Email</td>
<td>6221 <a href="mailto:andrew.ware@umontana.edu">andrew.ware@umontana.edu</a></td>
<td></td>
<td>9/18/08</td>
</tr>
<tr>
<td>Program Chair</td>
<td>Andrew Ware</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dean</td>
<td>Gerald Fetz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### III. Description and purpose of the course:

General Education courses must be introductory and foundational. They must emphasize breadth, context, and connectedness; and relate course content to students’ future lives: See Preamble: [http://www.umt.edu/facultysenate/gened/GEPreamble_final.htm](http://www.umt.edu/facultysenate/gened/GEPreamble_final.htm)

Continuation of a survey of classical physics, covering thermodynamics, electricity, magnetism, and optics. Along with PHYS 211N, serves as the lecture portion of a general introduction to classical physics for students interested in majoring in the physical sciences (geology, chemistry, physics, and computer science) and engineering. The laboratory portion is provided by PHYS 213-214N.

### IV. Criteria:

Briefly explain how this course meets the criteria for the group. See: [http://www.umt.edu/facultysenate/ASCRCx/Adocuments/GE_Criteria5-1-08.htm](http://www.umt.edu/facultysenate/ASCRCx/Adocuments/GE_Criteria5-1-08.htm)

1. Courses explore a discipline in the natural sciences and demonstrate how the scientific method is used within the discipline to draw scientific conclusions.

   The intimate connection between experiment and theory is stressed in this course. Broad classes of phenomena are distilled into general physical laws on a daily basis. Demonstrations of physical phenomena are used extensively to reinforce the concepts covered in class.

2. Courses address the concept of analytic uncertainty and the rigorous process required to take an idea to a hypothesis and then to a validated scientific theory.

   Analytic uncertainty is discussed in terms of measurements, significant digits, and error propagation. The process of testing a hypothesis is addressed in lectures and lecture demonstrations.

3. Lab courses engage students in inquiry-based learning activities where they formulate a hypothesis, design an experiment to test the hypothesis, and collect, interpret, and present the data to support their conclusions.

This is not a laboratory course.

### V. Student Learning Goals:

Briefly explain how this course will meet the applicable learning goals. See: [http://www.umt.edu/facultysenate/ASCRCx/Adocuments/GE_Criteria5-1-08.htm](http://www.umt.edu/facultysenate/ASCRCx/Adocuments/GE_Criteria5-1-08.htm)
1. Students will understand the general principles associated with the discipline(s) studied.  
   The principles of thermodynamics, electricity and magnetism, and optics are the general physical principles discussed in this class.

2. Students will understand the methodology and activities scientists use to gather, validate and interpret data related to natural processes.  
   Lectures and lecture demonstrations emphasize experimental verification of theoretical results.

3. Students will detect patterns, draw conclusions, develop conjectures and hypotheses, and test them by appropriate means and experiments.  
   A student response system is used to allow students to predict the outcome of experiments based on preconceived notions, then, time is given for students to reflect on their misconceptions and overcome them.

4. Students will understand how scientific laws and theories are verified by quantitative measurement, scientific observation, and logical/critical reasoning.  
   Classroom demonstrations, as described above, help to reinforce the process of moving from hypothesis to experimental verification. Students are required to give logical arguments to justify their responses.

5. Students will understand the means by which analytic uncertainty is quantified and expressed in the natural sciences.  
   Analytic uncertainty is emphasized in the corresponding laboratory course, PHYS 214N.

**VII. Syllabus:** Paste syllabus below or attach and send digital copy with form. The syllabus should clearly describe how the above criteria are satisfied. For assistance on syllabus preparation see: [http://teaching.berkeley.edu/bgd/syllabus.html](http://teaching.berkeley.edu/bgd/syllabus.html)

*Please note: As an instructor of a general education course, you will be expected to provide sample assessment items and corresponding responses to the Assessment Advisory Committee.*