Proposal to create a Departmental Minor in Physics

Introduction:

Many disciplines that are pursued on campus have physics as an important foundation upon which they are built. In many other disciplines knowledge of physics can play a useful role. This is evidenced by the fact that a large number of disciplines require that students study freshman physics degree as part of their requirements. Many students desire to understand physics at a level that surpasses that provided by the freshman physics courses. While those students are free to take additional physics courses beyond the freshman level, the purpose of this departmental minor is to encourage, and give appropriate credit for the coherent course of study that will comprise this minor.

As an example, an engineering student may be interested in studying in depth the quantum mechanics that underlies how a solid state device works. Achieving that understanding requires coursework that goes significantly beyond the freshman level but would not require the course work that satisfies the existing BA or BS. The minor in physics would encourage and reward such students. This example is but one of many such examples one could construct.

The goal is to give students the opportunity to take course work in physics that goes significantly beyond the 1st year courses and be recognized for having done so. To achieve this the students would be required to take the same foundational courses in physics that the majors do, and then take a selection of courses at the upper levels that allows them to explore in detail more advanced topics that they find useful or interesting.

It is important to note that this is a minor that is “within the department”.

Faculty who will Teach:
This minor is comprised of course offerings that are already offered by the Physics and Astronomy department (and math department). The courses are taught every academic year.

Comparison of Requirements:
Given the overlap between degree requirements the minor in physics should not be open to students who major in Astronomy or Astrophysics.

The Minor in Physics presented here requires 35 credit hours, significantly more than the guideline of 18 to 24 credit hours. It should be noted that of the 35 credit hours, 14 (PHYS 101, PHYS 102, MATH 101, MATH 102) are common to a large number of majors. Also, this should
be compared to the BA in Physics, which requires 47 credit hours. Requiring any more than 35 credit hours would make the minor in physics so close in requires to the BA to be redundant.

Learning Outcomes:

- Acquire and demonstrate a solid foundation of knowledge in physics
  - This includes
    - Basic Mechanics
    - Basic Electromagnetism
    - Maxwell’s equations in differential form
    - Waves, interference, and diffraction
    - Special relativity
    - The Schroedinger equation and the wave formulation of Quantum Mechanics
- Acquire and demonstrate knowledge in a number of advanced physics topics of their choosing.
- Recognize the importance of science in issues affecting their everyday lives. They use scientific approaches and think critically in evaluating articles in the scientific and popular press.

Curriculum Map:
The Basic foundation in physics is mapped as follows:

<table>
<thead>
<tr>
<th>Learning goal</th>
<th>Corresponding Course(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Mechanics</td>
<td>PHYS 101 (or PHYS 111)</td>
</tr>
<tr>
<td>Basic Electromagnetism</td>
<td>PHYS 102 (or PHYS 112)</td>
</tr>
<tr>
<td>Maxwell’s equations in differential form</td>
<td>PHYS 201</td>
</tr>
<tr>
<td>Waves, interference, and diffraction</td>
<td>PHYS 201</td>
</tr>
<tr>
<td>Special Relativity</td>
<td>PHYS 202</td>
</tr>
<tr>
<td>Shroedinger equation and Wave Mechanics</td>
<td>PHYS 202</td>
</tr>
<tr>
<td>Advanced topics</td>
<td>Electives at the 300 level or higher</td>
</tr>
<tr>
<td>Importance of science issues</td>
<td>All courses</td>
</tr>
</tbody>
</table>

Assessment Plan:
The minor in physics is a subset of the physics major. As such it is will be natural to assess the program with the same procedures that are used in the major
Degree Requirements for the Minor in Physics:

The minor in physics is not available to students who major in Astronomy or Astrophysics.

All students must complete the following:

- PHYS 101 or 111
- PHYS 102 or 112
- MATH 101
- MATH 102
- MATH 211
- MATH 212
  
  NOTE: (MATH 221 and 222 Honors Calculus III and IV may substitute for MATH 211 and 212)

- PHYS 201
- PHYS 202

At least 9 credit hours PHYS courses at the 300 level or higher.