2. SLO(s) being assessed: Student will...
   SLO 10: Students will understand and appreciate methods and issues of science and technology.

3. AGSC Content Area of Alignment:
   Area III: Science and Math

4. Assessment Method(s):
   [Explain how assessment for the measures associated with this SLO - not grading for the course as a whole - was conducted. You may cut/paste rubrics for inclusion here, identify faculty reviewing committees, or identify specific kinds of test questions important to your method. Is this the method you initially planned to use? Provide a separate paragraph for each method].
   
The department has identified the following assessment methods: homework problems, laboratory experiences, classroom interactive sessions and test/exam questions. Faculty may elect to use any or all of these assessment methods to evaluate the effectiveness of their teaching. The instructor teaching PHYS 1150 used tests/final examination as the mode of assessment. Several problems that relate, as close as possible, to the intents of each of the five measures associated with SLO 10 were included in the assessments. The department committee overseeing this course met on March 28, 2013, to discuss the results of these assessments. The committee members were: Chin-Che Tin (Chair) Satoshi Hinata Stuart Loch Joseph Perez Besides the committee members listed above, the committee chair also invited other faculty members teaching introductory physics courses to the meeting to participate in the discussion. In reconciling the language of the measures within SLO#10 with the topics normally covered in the physics courses, the department has chosen to adopt the following interpretations of the different measures. Instructors have used these interpretations as a general guideline in their choice of questions. Measure 1: Use questions involving fundamental principles of physics such as the conservation laws. Measure 2: Use problems involving basic mathematical skills such as vector and scalar addition and subtraction, derivative and integration (for calculus-based class), finding slope and area (both algebra and calculus-based class), dot and cross products (calculus-based class), and common experimental techniques. Measure 3: Deduce information from graphical, tabulated, or experimental data. Measure 4: Problems showing connections between science and society involving topics such as energy, health, etc. Measure 5: Problems requiring knowledge and demonstrating analytical skills especially in those areas not covered above. The following grading scale was used to determine competency level and this was based on typical scores obtained from assessments over the last few years. Test/Exam: ≥ 85%: Advanced Ability 60 – 84%: Intermediate Ability 40 – 59%: Basic Ability ≤ 39%: Little or No Ability

5. Findings: What assessment data did each assessment method produce?
   Average score using tests/exam: 82.2%
   Attachment name: PHYS 1150-Fall2012.pdf

6. Based on the comprehensive rubric for the appropriate SLO(s), indicate the extent of competency of the average student who has completed this core course in each learning outcome assigned to it:
<table>
<thead>
<tr>
<th>SLO</th>
<th>Level of Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLO 10</td>
<td>intermediate</td>
</tr>
</tbody>
</table>
Core Curriculum Assessment Report 2012-2013

Department: Physics
Representative: Michael Bozack, James Hanson
Academic Year: 2012_13
Course Name / number: PHYS1150

7. How did you (or will you) use the findings for improvement?
   (What questions / issues / concerns did your data raise for the faculty teaching the course? What discussion did the faculty have about the findings? What future actions to improve student attainment of this outcome will the department / program take as a result of this analysis?)

   The average score was significantly higher than usual for introductory physics courses. There is a possibility that questions were simpler than usual. Instructor's comments: The trend is the same as previous semesters; that is, it is a challenge for most students outside the science and engineering to deal with mathematical relations. The vector addition is particularly difficult. It requires demonstration and exercise. But, we did not have enough time allocated to the practice. We for the first time have adopted an ebook, and I had difficulty pacing the course. Hopefully, we may allocate more time for practice in the class.

8. Additional Comments:
   (What else would you like the Committee to know about your assessment of this course or plans for the future?)

   The department continues to have strong reservations about the language used in the description of the various measures constituting SLO#10. The wording of the measures does not match with the typical questions normally used in Astronomy courses. The department faculty believes that the department should be the one to determine the proper questions to use in the assessments. The instructors were therefore asked to use their best judgment in choosing the appropriate questions with the broad intents of the measures in mind.

9. Committee Comments:
<table>
<thead>
<tr>
<th>Measure</th>
<th>Problem</th>
<th>% Average Score</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1.1</td>
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<tr>
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</tr>
</tbody>
</table>

Average 82.2

Average Competency Level Intermediate Ability
PROBLEMS:

Measure 1: Articulate the philosophical and historical foundations of modern science.

1.1 This diagram shows the apparent locations of the Mars against background of faraway stars. On what model is this diagram based?
   A. Geocentric model
   B. Heliocentric model
   C. Other

1.2 This is a record of light intensity from a star outside of the Milky Way. What does this show?
   A. The interference by the solar wind.
   B. The star suddenly flaring up.
   C. The microscopic lensing effect by dark matter in the halo of Milky Way.
1.3 If you observe a galaxy moving away with a speed $3.55 \times 10^4$ km/s, what is the distance of this galaxy from us?
   A. 300 Mpc
   B. 250 Mpc
   C. 500 Mpc
   D. 645 Mpc
   E. Other

![Graph showing the relationship between velocity and distance]

1.4 The homogeneity and isotropy of the universe is called as “Cosmological Principle” as the standard big band theory cannot explain it; that is, according to the standard theory, the different parts of the universe did not have time to communicate with each other, and hence each part developed independent of each other. How can this be overcome?
   A. The speed of light at the beginning of big bang was infinitely fast, allowing all parts to communicate each other.
   B. At a very early time, $10^{-35}$ s after the big bang, the universe expanded suddenly by a factor of $10^{50}$ or more; that is, the universe was much more compact than the standard theory.

**Measure 2:** Understand the scientific method and demonstrate an ability to apply it across a variety of situations.

2.1 There is a small object at $r = 9$ AU from the sun. How long does it take for this to make one round?
   A. 3 years
   B. 6 years
   C. 9 years
   D. 27 years
   E. None of the above

2.2 How does the intensity vary if the temperature is tripled?
   A. Increases by a factor of 3.
   B. Increases by a factor of 9.
   C. Increases by a factor of 27.
   D. Increases by a factor of 81.
   E. Decreases by a factor of 81.
2.3 If you want to observe a region of star birth, what spectral region of electromagnetic waves will you use?
A. Visible light
B. Ultraviolet
C. X-rays
D. Gamma rays
E. Infra-red

2.4 Cepheid variables are used to determine distance to a star cluster. What property of the Cepheid and what observation are used?
A. The luminosity is higher for a longer period of luminosity variation.
B. The luminosity is lower for a longer period of luminosity variation.
C. The apparent magnitude of the Cepheid.
D. A and C
E. B and C.

Measure 3: Demonstrate an ability to conduct, and interpret the results of experiments aimed at better understanding natural phenomena.

3.1 This diagram shows certain property of the circular motion with a constant speed. What can you learn?
A. This motion is not an accelerated motion.
B. This motion is an accelerated motion toward the center of the circle.

3.2 The dark spectral lines obtained through the gas are the same as the bright spectral lines in the scattered scattered light by the gas to the side.
A. They are different as the different chemical elements absorb and scatter specific colored light.
B. They are the same as the same chemical elements absorb and scatter specific colored light.
C. Neither A nor B is correct.
3.3 The study of binaries gives us information shown below. What is the luminosity of the 5MS star?
A. 5 LS
B. 10 LS
C. 100 LS
D. 1,000 LS
E. 10,000 LS

3.4 What type of galaxy is this?
A. Spiral galaxy
B. Elliptic galaxy
C. Irregular galaxy

M104: an Sa galaxy
Measure 4: Understand major issues and problems facing modern science and technology, including issues related to ethics, cultural values, public policies, and the impact of human activity upon the planet.

4.1 These images are taken of the same objects.
A. The left is from space & the right is from the ground with a large telescope.
B. Left is from the ground and the right is from space.

4.2 Since the photons emitted in the core travel only 1 cm before they collide with electrons and lose memory, they cannot be used to probe the core of the sun. Are there any means to probe it?
A. Neutrinos
B. Solar vibrations
C. A & B
D. None of these

4.3 What is the hazy blue region?
A. Emission from a hot gas.
B. Emission from a cool gas.
C. Scattered light of a star by gas and dust.
D. Other
5.1 How do you detect the magnetic field on the sun?
   A. The magnetic field bunches together the spectral lines. Thus, the single lines indicate the magnetic field.
   B. The magnetic field imposes extra force on a moving electrons, and hence changes the atomic structure. It is seen as the splitting of a line into three lines.

5.2 Star A has $M_A = 5$ & Star B has $M_B = -5$. What is the ratio of Intensities, $I_A/I_B$?
   A. 200
   B. 1,000
   C. 10,000
   D. 1/10,000
   E. 1/200

5.3 The peak intensity of star A with a surface $T = 5,000K$ is at $\lambda = 600nm$. What is the wavelength of the peak intensity of star B with a surface $T = 10,000K$?
   A. 300 nm
   B. 500 nm
   C. 600 nm
   D. 1,200 nm
   E. Other

5.4 When the helium burning takes place in the core, it happens explosively (called helium flush). Why is it not controlled like the hydrogen burning in the main sequence?
   A. It is controlled by increased pressure, but the reaction is just too fast.
   B. The pressure is supplied by the degeneracy of electrons, not by the heat of gas. Thus, the star will not expand and cool to reduce the reaction rate.
   C. Other