## Assessment of Course Student Learning Outcomes

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<tr>
<th>Gen Ed SLOs Assessed</th>
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<th>Assessment (Performance) Tasks &amp; Success Criteria</th>
<th>Assessment Results &amp; Analysis*</th>
<th>Action(s) Proposed</th>
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<td>III, VI, X</td>
<td>AA1</td>
<td>Lab 2 Measurements and Error Analysis</td>
<td>For each SLO, two lab reports were selected and assessed based on the stated SLOs. Students are required to complete lab experiments by assembling, calibrating, using equipment provided. Data must be collected during these performance activities and subsequently analyzed on computer using statistical analysis. Lab reports are written and returned the following week. Successful completion of lab SLO is based on 80% of the class achieving B or higher on the component of the report directly related to the SLO. Performance based assessment on these reports are judged by the percent error achieved in the data reduction.</td>
<td>15 of 18 (83%) achieved B or higher</td>
<td>Purchase new equipment</td>
<td>This proposed action requires a minimum of $50,000 over two years to initiate the required change. Subsequent years will require allocations of from $5,000 annually over the next 3 years to complete the inventory demands for PHYS 151L. Allocation of $25,000 was approved in May 2010. This was to purchase new or replacement equipment for physics and astronomy labs. A subsequent allocation of $25,000 was approved in May 2011. This will also be used to purchase equipment for physics and astronomy labs.</td>
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<td>AA2</td>
<td>Lab 7 Inertial mass systems</td>
<td>The statistical software packages used (Logger Pro and Graphical Analysis) are valuable tools in giving students efficient command of the reduction of large sets of data. In some cases, this also provides them immediate feedback in determining whether the initial data collection was insufficient and subsequent data collection required. The inventory of physics equipment insufficient to accommodate a full class of 20 students with two students assigned per lab station. This necessitates the tripling and sometimes quadrupling of teams per lab station. This long-outstanding deficiency is slowly being corrected with supplemental funds for the purchase of some additional physics equipment. The physics lab is fully integrated with the associated lecture section PHYS 151. Students have commented in their course assessments at the end of each semester that this integration is extremely valuable in their applying the concepts on the material presented in lecture.</td>
<td>16 of 18 (89%) achieved B or higher</td>
<td>Provide more students with more hands-on experience with actual laboratory equipment.</td>
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<td>AA3</td>
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<td>AA11</td>
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1. Apply the scientific method to physical science systems involving mechanics, energy, simple oscillatory systems, gas laws and fluid dynamics.
| II, III, IV | AA2  
AA3  
AA5 | 2. Collect, report and analyze data obtained in a laboratory setting in a manner exhibiting organization, proper documentation and critical thinking. | Lab 4 Acceleration on an air track  
Lab 9 Conservation of Energy | 16 of 18 (89%) achieved B or higher  
16 of 18 (89%) achieved B or higher |
| II, III, X | AA2  
AA4  
AA9 | 5. Identify environmental factors, which affect the outcome of an experiment or observation and apply basic error analyses techniques. | Lab 10 Inelastic Collisions  
Lab 11 Uniform Circular Motion | 14 of 18 (78%) achieved B or higher  
15 of 18 (83%) achieved B or higher |
| III, IV | AA3 | 3. Manipulate data and apply quantitative techniques, such as graphing and statistical analysis | Lab 1 Basic Graphing Techniques  
Lab 3 Pendulum graphing | 15 of 18 (83%) achieved B or higher  
16 of 18 (89%) achieved B or higher |
| IV | AA9 | 4. Demonstrate a basic understanding of the standard instruments used in physics. | Lab 10 Inelastic Collisions  
Lab 11 Uniform Circular Motion | 14 of 18 (78%) achieved B or higher  
15 of 18 (83%) achieved B or higher |
Appendix A. Sample Assessment tools

- setting up the apparatus inform the instructor for assessment of correct assembly

- Plot the torque ($\tau$) vs. angle acceleration ($\alpha$). (attach your graph to this report.)

- Use least square method (Logger Pro, Graphical Analysis or some other statistical software package) to determine Experimental Moment of Inertia ($I_{\text{exp}}$)

- Calculate the % error between the experimental ($I_{\text{exp}}$) and theoretical ($I_{\text{theor}}$) moment of inertia

- Identify some possible major sources of error in this experiment.

\[ W = Mg \]
Appendix B. Additional Analysis of Assessment

SLOs 1 through 3 achieved the minimum criteria for success on both selected lab reports.

SLO 4 (Demonstrate a basic understanding of the standard instruments used in physics) and SLO 5 (Identify environmental factors, which affect the outcome of an experiment or observation and apply basic error analyses techniques) achieved the minimum criteria for success on one of the selected lab reports. Discussions with the students during the lab and after the graded assignments were returned suggest that not all students were able to become actively engaged with the apparatus. With the lack of adequate physics equipment, students were required to team in groups of three rather than in standard group of two. This hindered some students from sufficient time to interact with the apparatus.