# Annual Program Learning Outcomes Assessment Summary Report

**Program:** PROGRAM NAME - PHYSICS/ENGINEERING/COMPUTER SCIENCE  
**Date:** 15 December 2009

## Assessment Schedule - Due: December 16, 2009

1. **Past Year:** Indicate which program level learning outcomes assessment or any other assessment projects you completed in the 2008-2009 academic year.

<table>
<thead>
<tr>
<th>Learning Outcomes:</th>
<th>Action:</th>
<th>Date Completed:</th>
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</table>
| Have college-level knowledge and skills in critical thinking, quantitative analysis, and written composition. | - Physics and Engineering word problems: Students are asked to apply the concepts of physics and engineering to problems by asking what tool can be used to solve the given problem (such as conservation of energy).  
- Physics and Engineering students use the Physics Education Group’s Tutorial for labs and homework. These tutorials were crafted through research to lead students to explicitly examine their misconceptions in physics theory.  
- For example, Physics 121, 221 and ENGR 214 and 215 explicitly outlines the use of linear and quadratic equations to understand kinematics, the use of trigonometry to analyze projectile motion, 2-D applications to Newton’s Laws and Conservation of Momentum and solving systems of equations in both kinematics and dynamics. | June 2009 |
| Demonstrate effective oral and written communication, teamwork and collaboration in scientific, mathematical and other settings. | - Nearly all physics labs and engineering projects are done in teams and several capstone projects in both physics and engineering courses require team oral presentations. | June 2009 |
| Have the ability to design and conduct experiments, as well as to analyze and interpret data. | • Physics students are often required to design their own experiments once they understand the equipment. For example in PHYS 122 & 222 lab students are asked to design simple DC circuits that exemplify basic principles of circuits. They then set up these circuits and then by taking measurements demonstrate a variety of principles. | June 2009 |
| Have college-level mastery of information literacy and be technologically literate. | • In physics 123 and 223 and in ENGR 215, students choose a rotational phenomenon to study – Frisbees, Tippe Tops, spinning books, pool, bowling, gyroscopic motion, rattlebacks, bicycle stability, swinging (on swings), martial arts, etc. The explanations while fairly complicated are within reach of most students in third quarter physics. The students do a library search and have to re-interpret explanatory articles in terms of the physics language that they know. Students present to the class with the objective of teaching them how the rotational phenomena work. The information literacy project has helped the students considerably to perform well on this project. | June 2009 |
### ANNUAL PROGRAM LEARNING OUTCOMES ASSESSMENT SUMMARY REPORT

**PROGRAM:** PROGRAM NAME - PHYSICS/ENGINEERING/COMPUTER SCIENCE  
**DATE:** [15 DECEMBER 2009]

- Physics and Engineering courses employ a number of specialized software programs, including Physlets (Java applets that explain physics), Mathematica, Matlab, an Engineering Equation Solver, and a 2D Bridge modeling software. Students use word processing programs to write up reports and spreadsheets or data analysis visualization software to model data – embedding graphs and data within their reports to illustrate their findings.

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### 2. Current Year: Indicate which program level outcomes you plan to assess or other assessment projects you plan to complete in 2009-2010:

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<th>ACTION:</th>
<th>COMPLETE BY:</th>
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</table>
| Have college-level knowledge and skills in critical thinking, quantitative analysis, and written composition. | Calculus based Physics (221, 222, 223)  
  - Assess the effectiveness of labs: physics students will have the option to turn in drafts of their lab reports, so that the instructor can assess the students’ understanding of the lab concepts.  
  - Assess students’ understanding of lectures via Interactive Lecture Demonstrations: students watch a demonstration at the front of the class, and are asked to write down a prediction. Answers are collected and graded by the instructor.  
  Computer Science (CSC 110)  
  - Assess students’ understanding of programming | June 2010                                                              |
3. If you have a longer term assessment plan that spans more than two years, please describe.

N/A

ASSESSMENT REPORT for academic year 2008-2009

DEMONSTRATION OF LEARNING: What assignments or projects demonstrate student learning outcomes are achieved? What evidence do you have that students are achieving the learning outcomes? You may choose to focus on one or two learning outcomes each year.

<table>
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<tr>
<th>Learning Outcomes</th>
<th>Assessment methods</th>
<th>Evidence of Learning</th>
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<tbody>
<tr>
<td>Have the ability to design and conduct experiments, as well as to analyze and interpret data.</td>
<td>• Physics student are often required to design their own experiments once they understand the equipment. For example in PHYS 122 &amp; 222 lab students are asked to design simple DC circuits that exemplify basic principles of circuits. They then set up these circuits and then by taking measurements demonstrate a variety of principles.</td>
<td>Students’ work quality has improved showing a better understanding of concepts.</td>
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<tr>
<td>Understand methods of inquiry specific to</td>
<td>• In ENGR 215 (Engineering Dynamics) students investigate</td>
<td>Students were very involved in their projects, and gave very interesting presentations.</td>
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**ANNUAL PROGRAM LEARNING OUTCOMES ASSESSMENT SUMMARY REPORT**

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<th>traditional and contemporary areas of knowledge in mathematics and the natural and physical sciences.</th>
<th>more advanced problems in small groups. The projects involve research, experimentation, analysis and presentation (example: why should a trebuchet be mounted on rails?, why might a bike flip over when the front brakes are applied?).</th>
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<td>Be able to appreciate and apply their knowledge of science in the outside world.</td>
<td>• Engineering students participated in an intercollegiate competition (pine wood derby) at Highline CC: they built their own race car, then raced it against other teams from other colleges in the state.</td>
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**EXTERNAL EVIDENCE?**

Alumni, employer, Curriculum Review or Technical Advisory Committee feedback? What data from outside the classroom have led to curriculum changes?

- WCERTE (Washington Council for Engineering and Related Technical Education) semiannual meetings have been successful forums for reviewing curriculum issues.
- Collaborations with other four year universities (mostly the University of Washington) have led to curriculum revisions.
- Partnerships with Engineering instructors at other 2 year colleges (e.g. Highline CC) have led to curriculum additions and modifications.
- Science and Math faculty retreats have been a successful forum for reviewing program level curriculum issues.

**FINDINGS:**

What do you conclude from your outcomes assessment activities? Are curriculum changes needed?

- Students’ feedback (e.g. via course evaluations) has been consistently positive. Our students who transfer to a four year university have done well as reported by conversations with advisors. Our anecdotal findings in our courses also match what has been learned by the Physics and Engineering education research community.
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ACTIONS TAKEN: What, if any, program changes have you made in the past year as a result of assessment activities. WHAT WAS THE IMPETUS FOR THE CHANGE?

Physics and Engineering:

- Faculty attend the semiannual WCERTE meetings. This is a place where Washington State engineering institutions come together to discuss current trends in Engineering education and industry, and to set forth recommendations for engineering degree requirements.
- Faculty ensure that SCCC engineering courses are equivalent to UW courses through regular investigation of UW courses and requirements and implement curriculum changes (e.g. a new programming language in ENGR 142).
- Most courses are now supported by a full website with resources to support the curriculum.
- Students have been encouraged to participate in Engineering competitions, such as HPPV or intercollegiate pinewood derby races.
- Sections of ENGR 110 have been added to attract more students to our program.
- The department offers a complete list of courses required for a pre engineering degree.

Computer Science:

- Faculty regularly attend the Working Connections IT Faculty Development Institute. This is a place where industry and educator come together to match the IT educational needs to industry requirements.
- Faculty ensure that SCCC computer science courses are equivalent to UW courses through regular investigation of UW courses and requirements and implement curriculum changes to incorporate new programming languages as they are introduced.
- All courses are now supported by a full website with resources to support the curriculum.

ACTIONS PLANNED: Based on what you learned from assessment activities this last year for the above learning outcomes or other assessment activities, are there any follow-up activities planned or required?
We are planning on trying new activities in classes such as Interactive Lecture Demonstrations (ILD) possibly using clickers. Using pre and post test for lab and tutorial activities to measure student learning.