

Program: Physics

Date: June 1, 2017

Completed by: Bruce N. Lundberg

Assessment contributors (other faculty involved in this program’s assessment): None available: the one tenured fac. is on sabbatical

I. Program student learning outcomes (SLOs) assessed in this cycle, processes, results, and recommendations.

NOTE: There were no Physics Program graduates Spring 17, and the one Spring 16 graduate took the Math MFAT but not the Physics MFAT.

A. Which of the program SLOs were assessed during this cycle? Please include the outcome(s) verbatim from the assessment plan.	B. When was this SLO last assessed? Please indicate the semester and year.	C. What method was used for assessing the SLO? Please include a copy of any rubrics used in the assessment process.	D. Who was assessed? Please fully describe the student group(s) and the number of students or artifacts involved.	E. What is the expected achievement level and how many or what proportion of students should be at it?	F. What were the results of the assessment?	G. What were the department’s conclusions about student performance?	H. What changes/improvements to the <u>program</u> are planned based on this assessment?
(SLO #2) Understand and apply knowledge of the various subfields of physics at the undergraduate level.	Spring 2014 (This assessment will be performed every year.)	The assessment tool is a standardized examination: the MFAT in Physics	All graduating physics majors.	Criterion: Overall and in the two breakdown areas of the MFT, ninety percent of CSU – Pueblo physics majors will score at or above the 50 th percentile on the MFAT standardized exam.	We had no graduates this year. Last year’s graduate, James Todd, finished his first year as a Physics PhD at CSU-FC. He did not take the Physics MFAT, but scored at 84 %-tile on the MATH MFAT.	Last year’s graduate was a very good double major in Physics and Math. He is doing well in the Physics PHD program at CSU. But we need to recruit more physics majors..	Based on feedback from James Tood in exit interview and subsequent conversations on his experience in CSU: Make more efforts to gradually build rigor and capabilities in Intro to Physics, and give more research experiences and support at upper division level. This will require a commitment to hire, develop and keep qualified, young and energetic new faculty. Keep recruiting strong independent students for the physics major. This last improvement is in conflict with our lack of Tenure track physics PhD faculty I am growing in hope and optimism due to the good effects of the VAP positions this and next year, and the promise of a TT hire starting Fall 18. . I have great concern over the continued

							viability of the physics service program, let alone the physics major itself.
(SLO #3) Effectively communicate their results orally and in writing (SLO #4) Learn independently, locate and use appropriate sources of technical material and make use of modern scientific and computational tools	June 15	Student independent topic research leading to a presentation in Phys 323 to develop them for later senior seminar.	3 Junior level Physics students.	Chair attended 15 minute talks to provided independent assessment of substance and presentation quality.	All three students presented good substantive talks, with good audience questions, and suggestions for improvements.	Students did well for a first talk, but need more practice in researching and presenting topics in physics.	Start a freshmen seminar for new majors, where talks are given by faculty, visitors and students. Institute mini-research projects with talks in at least two upper level physics courses, Phys 323 (first jr. course) and one other prior to Phys 499.

Comments: See comments below.

II. Follow-up (closing the loop) on results and activities from previous assessment cycles. In this section, please describe actions taken during this cycle that were based on, or implemented to address, the results of assessment from previous cycles.

A. What SLO(s) did you address? Please include the outcome(s) verbatim from the assessment plan.	B. When was this SLO last assessed? Please indicate the semester and year.	C. What were the recommendations for change from the previous assessment?	D. Were the recommendations for change acted upon? If not, why?	E. What were the results of the changes? If the changes were not effective, what are the next steps or the new recommendations?
(SLO #2) Understand and apply knowledge of the various subfields of physics at the undergraduate level. (SLO #3) Effectively communicate their results orally and in writing (SLO #4) Learn independently, locate and use appropriate sources of technical material and make use of modern scientific and computational tools	June 2016 June 15.	Work to strengthen the Phys 221-222 Calc-Based sequence to prepare students for upper division courses. Work for new tenure track faculty members with a physics Ph.D who is energetic, and a committed leader.	Partially—This last year we have had two VPAs: Dr. Caixia Gao (borrowing from a Math Lecturer position plus using Endowment \$), and Dr. Shamim Akhtar (sabbatical replacement for Dr. Brown). We hope to gain in quality and morale by these two young scholar-teachers. We heard the great news of a committed to a TT hire for Fall 18, with \$ for keeping Dr. Akhtar as VPA for AY17-18. We are up in Physics Majors from 5 (May '15) to 8 (May '16) to 19 (May '17), and the quality of our service to Chem, Eng. & Math is rising. The the program and service teaching is climbing out of a very unworkable condition.	We hope to gain in quality and morale by these two young scholar-teachers. Dr. Gao has indeed worked well, added enthusiasm and quality to our teaching and scholarship in physics. However, the physics program needed a minimum two new committed (i.e. Tenure Track, Physics PhD) faculty to be viable. The loss of one position from Mathematics and physics work taken up by Math faculty has weakened and stressed current math faculty, lowered quality, and made us less flexible and forward looking.

Comments: With the resignation of Karen Lundberg May 2015, a lecturer position was opened, and used to hire a visiting physics lecturer, Dr. Caixia Gao, who has worked out well. Using the Sallie Watkins Endowed Professor of Physics money, we were able to keep Dr. Gao (who planned to leave for another position) for AY 16-17 by upgrading her position to Visiting Assistant professor. In March 2016 another new PhD physicist, Shamim Ahktar, was successfully hired as a sabbatical replacement for Dr. Brown's AY 16-17 sabbatical. Dr. Shamim has performed very well, and we are pleased to be able to keep her for another year, due in part to the funding of a (yet unfilled) position to replace Dr. Marta Wallin 3 years after her retirement Spring 2014. These concrete actions, and the resulting presence of two young, happy and energetic physicists this past year, have give a bit of hope and new life in the physics service and majors program, and probably enabled some new solid majors to be recruited. Morale has improved, and the one tenured physics program has continues to be more engaged with active recruiting, willingness to advise a new major, attending and energetically reporting on a conference in physics teaching and program building, etc. It is not surprising if this one tenured faculty member is not active in program review or program assessment. Progress has been made, but the visiting positions gives uncertain program commitment to and from the visiting people. We very much need a faculty member to lead the program and its development by hiring a mid-career Physicist—but funding is for the assistant professor level. Even a physics service program for Chemistry, Engineering, Math, Biology, Exercise Science, etc. was not viable without replacing Dr. Wallin. Dr. Brown talks of retirement, but is committed to returning AY17-18 following his sabbatical year. Please see below for the Chair's UBB Report, and the UBB Review Form to which this is a response, for further information on our context, needs, hopes, and what can reasonably be expected of a physics program line ours.

TO: UBB Members,

April 25, 2017

FROM: Dr. Bruce N. Lundberg, Professor of Mathematics and Chair of Math and Physics

Thank you for the opportunity to comment to UBB. I appreciate the feedback form comments recognizing our need and sad position. As for the recent drop in majors, it would indeed be a wonder (or perverse) if majors did not decrease once we lost the last of our four physics PhD's three years ago. Adequate staffing is a truly desperate need that cannot be avoided by cancelling the major, which is a small fraction of the service we offer to other departments and Gen Ed. Regarding costs, there seem to be contradictory statements about costs in the feedback form. Our costs are very close to the bottom at \$2540/St FTE, and have decreased due to gutting our staff, amid increasing service obligations. I strongly challenge any idea that CSU-P could, by dropping the Physics major program, save any money and still maintain minimal quality in the service courses in physical sciences which still must be offered for other majors and Gen Ed, requiring of our Department over 4 FTE faculty per year just to staff the service courses in Physical Sciences. It takes barely over 1 FTE more to run the physics major, adding much to the service instruction, if the service staffing needs are adequately staffed by full time qualified instructors (e.g. 3 PhD's in physics, plus a lecturer). Without the major, recruitment, development and retention of real physics instructors, it will be virtually impossible. Loss of the major would be a great loss to the local region, the chemistry, math and engineering programs, and to the University and its students. To put our staffing levels in national perspective, see data table on page 2, and other data and discussion, in <https://www.aip.org/sites/default/files/statistics/undergrad/ugradprosize-pa-14.pdf>

Keep in mind too that the physics program (Major) is one of 3 programs within the (please note: **single**) Department of Mathematics and Physics. A strong physics service program is critical and central to our excellent math programs, STEM education, majors and careers. Also, exciting new potential: discoveries, applications and questions, are emerging from physics of late. In the USA, the numbers of physics majors continue to rebound by about 5% per year since 1999, reaching an all-time high of 8081 in 2015. Still, physics BS degrees represent only about 2 per 1000 bachelor's degrees. US Labor Statistics predicts 7% growth in physics jobs, not counting other technical jobs. We have a long line of prominent and successful physics alumni, including recent graduates in PhD programs.

Recently, yet too late for a search until Fall 17, hopeful news came that we may search for a replacement of Dr. Wallin's position. This is a start. Chronic understaffing, and cherry picking retirements during budget crises, have taken a heavy toll on morale and quality in our physics service program over the years, seriously depressing the recruitment of physics major. Even so, with two visiting women with new PhD's in Physics (through sabbatical replacements, shifting a position from math (hopefully temporarily), and using some small earnings from a physics endowment fund), along with modest new recruiting efforts, we have already jumped to a current 19 majors from the 8 majors shown on the UBB sheet for AY15-16. To put our Physics graduate numbers in perspective, "Slightly more than half of the physics departments that award a bachelor's degree as their highest degree averaged 5 or fewer degrees per year." One quarter of these graduate 2 or fewer per year. But note that our Physics program graduate counts on the table UBB provided give 2, 4, 5, 2, 2, 1 graduates for the years 2010-11 through 2015-16. The possibilities for students are bright and exciting with adequate staffing! PLEASE HELP!

UBB Academic Department Review Feedback Form 2017

Department: Physics	Categorical Designation: Yellow
Is the department categorical designation appropriate? Yes	1=Yes (3) 0= No (1)
If no, which designation seems more appropriate? Small number of majors- dept. or program	
Alignment with strategic planning priorities Do overall budget allocations in this department seem to be aligned with the Strategic Planning priorities? 1=Yes 0=No	
Examples of positive alignment: <i>Service courses.(?)</i> Concerns about alignment: <i>Why only one TT faculty?</i> <i>Percentage of students taught by TT faculty has decreased since 2010-11 and wasn't that high to begin with.</i>	
What strengths were noted by the group in the department's data or data trends? <i>Steady student FTE</i> <i>Student FTE is about the same as 2010-11.</i>	
What areas of concern were noted by the group in the department's data or data trends? <i>How do you have a program with only one TT faculty?</i> <i>Costs going up... why?</i> <i>Degree to major ratio is very low (impacted by small number of students)</i> <i>The number of majors has dropped which could be a concern because it's not a big program to start.</i>	
Suggestions for further analysis or review <i>Should this be a major or primarily offer Courses needed for other programs?</i> <i>Need strategy to grow major in students and faculty.</i> <i>2016 CSUP cost as a percent of 2011 Delaware data is 38% which has actually gone down since 2011. Much of this appears to be because of the increase in part-time faculty teaching.</i>	
Suggested strategies to build upon strengths or address concerns? <i>Should this be a major, given resources?</i> <i>Need more TT faculty?</i>	