Student Outcomes Assessment and Success Report AY2019-20 ***Consult with your college dean's office regarding due date and how to submit. Deans will submit reports to the Office of Assessment & Accreditation annually by October 15.***

Unit/Program Name: Physics Program, Department of Chemistry & Physics **Contact Name(s) and Email(s)** Joe West; Joseph.West@indstate.edu

Part 1a: Summary of Student Learning Outcomes Assessment

NOTE: If data from Spring 2020 is missing due to COVID-19 transition issues, please describe these issues, their impact on your ability to assess student learning, and what, if anything, will change as a result.

a. What learning outcomes did you assess this past year? If this is a graduate program, identify the Graduate Student Learning Outcome each outcome aligns with.	**b. (1) What assignments or activities did you use to determine how well your students attained the outcome? (2) In what course or other required experience did the assessment occur?**	**c. What were your expectations for student performance?**	**d. What were the actual data/results?**	**e. What changes or improvements were made or will be made in response to these assessment results or feedback from previous year's report?** *Can expand on this in Part 2.*
1. Outcome #3 Students pursuing a baccalaureate degree in physics will carry out basic laboratory procedures demonstrating appropriate use of instrumentation, quantitative measurement, and data analysis.	All physics faculty members complete the "Laboratory Procedures Rubric" with the aid of graded laboratory reports from PHYS 215L, 216L, 315 and 316 and notes/observations made by faculty members concerning the students' laboratory work in these courses during the 2018-2019 and 2019-2020 academic years.	All of the categories in the rubric will be rated at least satisfactory. A satisfactory rating in a category means that at least 80% of the students are rated satisfactory or better in that category (an average score of 3 or better on a 5-point scale).	The faculty completed a copy of the rubric for each major who took at least one of the physics laboratory courses in the 2018-2019 and/or 2019-2020 academic years. The faculty met (virtually) on April 17, 2020 to discuss the results. Using all scores, averages were calculated for each student, in each course, in every category of the rubric. Five students were considered. The results show that the performances of all five students reviewed were rated as satisfactory or better in each category of the rubric. The target achievement has been met. The average rating was 3.8 with a standard deviation of 0.7.	The target level of achievement for "laboratory skills" was met during this review. No changes were considered. However, this review period marks the end of a dividing line in the curriculum. The newly introduced laboratory course PHYS 306, and the revised version of Modern Physics Lab (PHYS 308L) will be offered for the first time in 2020-21 (if online, PHYS 306 will be run as a live synchronous online course). Data obtained in the next few review cycles will be used to compare with the results of recent years.
2. Outcome #4 - Students pursuing a baccalaureate degree in physics will demonstrate professional (a) oral and (b) written communication skills.	(a) All physics faculty members complete the "Oral Communication Rubric" based on direct observations of student presentations in PHYS 215L, 216L, 315, 316, 405, and 499 and at professional meetings during the 2018-2019 and 2019-2020 academic years. (b) The physics faculty complete the "Written Communication Skills Rubric" based on student writing in laboratory reports, exams, and other assignments from upper-division courses during the 2018-2019 and 2019-2020 academic years.	All of the categories in the rubric will be rated at least satisfactory. A satisfactory rating in a category means that at least 80% of the students are rated satisfactory or better in that category (an average score of 3 or better on a 5-point scale).	(a) The faculty completed a copy of the rubric for each major who made an oral presentation as part of the requirements for physics courses and laboratories or at professional meetings during the 2018-2019 and 2019-2020 academic years. The faculty met (virtually) on April 17, 2020 to discuss the results. Using all scores, averages were calculated for each student in each category of the rubric. Five students were considered. The results show that the performances of all five students reviewed were rated as satisfactory or better in each category of the rubric.	The target level of achievement for "communication skills" was met during this review. No changes were considered. However, this review period marks the end of a dividing line in the curriculum. The newly introduced laboratory course PHYS 306, and the revised version of Modern Physics Lab (PHYS 308L) will be offered for the first time in 2020-21 (if online, PHYS 306 will be run as a live synchronous online course). Data obtained in the next few review cycles will be used to compare with the results of recent years.

	Included in this assessment were student virtual poster presentations for PHYS 216L in April 2020.		The target achievement has been met. (b) The faculty completed a copy of the rubric for each major with the aid of graded laboratory reports from PHYS 215L, 216L, 315, 316 as well as graded written assignments and exams from upper-division physics courses during the 2018-2019 and 2019-2020 academic years. The faculty met (virtually) on April 17, 2020 to discuss the results. Using all scores, averages were calculated for each student in each category of the rubric. Five students were considered. The results show that the performances of all five students reviewed were rated as satisfactory or better in each category of the rubric. The target achievement has been met. The average rating in these categories (a and b combined) was 4.0 with a standard deviation of 0.5.	
3.				

Note: *If you would like to report on more than three outcomes, place the cursor in the last cell on the right and hit "tab" to add a new row.*

Helpful Hints for Completing this Table

a. Use your outcomes library as a reference. Note any alignment with professional standards, as applicable.
b. Each outcome should be assessed by at least one direct measure (project, practica, exam, performance, etc.). If students are required to pass an examination to practice in the field, this exam should be included as one of the measures. At least one of the program's outcomes must use an indirect measure (exit interview, focus group, survey, etc.). Use your curriculum map to correlate outcomes to courses. Describe or attach any evaluation tools such as rubrics, scales, etc.
c. Identify the score or rating required to demonstrate proficiency (e.g., Students must attain a score of "3" to be deemed proficient; at least 80% of students in the program will attain this benchmark.)
d. Note what the aggregate level of proficiency actually was and the number of students included in the cohort or sample (e.g., 85% of the 25 students whose portfolios were reviewed met the established benchmark).

Part 1b: Review of Student Success Data & Activities

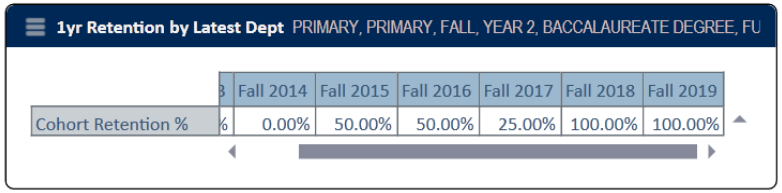
Use Blue Reports to generate the following information (as well as any other information helpful to you). A dashboard has been created in the Chairs view:

1) Cohort Sizes

Number of Majors Enrolled CENSUS, PRIMARY, ENROLLED STUDENT COUNT, FALL, ALL

	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020
Undergraduate	16	13	8	8	
Graduate					

2) Year-to-Year Retention



	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019
Cohort Retention %	0.00%	50.00%	50.00%	25.00%	100.00%	100.00%

3) 5-Year Graduation Rate (undergraduate)

Fall 2010	Fall 2010	Fall 2011	Fall 2011	Fall 2012	Fall 2012	Fall 2013	Fall 2013	Fall 2014	Fall 2014
Cohort Total	Cohort Graduation %	Cohort Total	Cohort Graduation %	Cohort Total	Cohort Graduation %	Cohort Total	Cohort Graduation %	Cohort Total	Cohort Graduation %
10	10.00%	3	66.67%	4	25.00%	8	25.00%	5	60.00%

What worked well in supporting student success this year?

We provided opportunities for 4-6 undergraduates to participate in hands-on physics research under the direct mentorship of a faculty member during the summer through the 2019 Summer Undergraduate Research Experiences (SURE) program, and during the regular semesters for credit (PHYS 399 or 499).

We secured Supplemental Student Wages to fund the Science Help Center—a free, drop-in tutoring service for students in freshman- and sophomore-level physics and chemistry courses.

We encouraged Physics majors and minors to participate in the Society of Physics Students (SPS). The group's faculty advisor, Sean Bartz, found that using a project-based approach, rather than organized social activities, was more effective in attracting students to the group. The model-rocket-building activity last year was very popular with students, and he is looking for new projects for the coming year. Participation in SPS fosters a sense of community among Physics majors and gives the students opportunities to interact with the faculty in an informal, small-group setting. They get career and graduate school advice from faculty in such a setting and learn more about the profession of physics.

We employ physics majors as tutors in the Science Help Center and as lab assistants for the 100-level physics lab courses. When students have to "teach" other students as a tutor or in a lab, they learn the material better themselves—this helps solidify their knowledge of fundamental concepts and makes it more likely that they will perform well in their upper-level physics courses. The habits and skills they develop in these settings are also directly relevant to career readiness.

What are the most significant opportunities for improvement upon which to focus in the coming year?

The physics program is small, with only 10-12 majors at a given time, and several highly engaged students graduated in 2020. We need to find a way to attract more strong students who are taking PHYS 105 or 115 (as a service course) to choose to major or minor in physics. We are attempting to do this by providing an opportunity for students to participate in an optional small-group project in each course which they could use to convert the course for honors credit. About a dozen students participated in the honors-conversion projects during AY2019-20.

Part 1c: Summary of Career Readiness Activities – required for undergraduate programs; optional for graduate programs

If you submitted a report last year, you only need to resubmit if there are changes to your current career readiness competencies map.

We submitted a career readiness competencies curriculum map for the AY2018-19 cycle. There are no changes for the AY2019-20 cycle.

If you have not previously done so, please submit your Career Readiness Competencies curriculum map along with this report as a separate attachment. You can find the template here: https://www.indstate.edu/assessment/plan-components

Part 2: Continuous Quality Improvement

Reflect on the information shared above regarding student learning, success, and career readiness. In no more than one page, summarize:

1) **the discoveries assessment and data review have enabled you to make about student learning, success, and career readiness** (ex: What specifically do students know and do well—and less well? What evidence can you provide that learning is improving? How might learning, success, and career readiness overlap? What questions do your findings raise?)

Our assessment process measures four outcomes, with two measured on alternate years. This year Outcomes #3 and #4 were measured, pertaining to laboratory skills and oral and written communication skills.

We had no students with scores below "meets expectations" for either Outcome. This year we incorporated the use of pre-lab quizzes in two lab courses, PHYS 315 and 316. We believe this has helped ensure that students come to the lab better prepared to do the experiment, so that they can be more focused during class and get the most out of the time spent in the lab working with instrumentation and interacting with faculty.

See information in Part 1b above regarding what worked well, and how student learning relates to career readiness. For example, working as a physics tutor in the Help Center or undertaking a research project with a faculty mentor contributes to the development of a variety of career readiness skills.

One of the most impactful experiences that any physics student can have is an intensive research experience. Such experiences help students improve their general problem-solving, teamwork, and communication skills. Overall, they contribute significantly to student success and career readiness. More specifically, research experiences regularly motivate students to re-focus their efforts in the physics classroom and laboratory, and their performance in courses tends to then improve. In terms of career readiness, an undergraduate research experience is (nearly) essential for any student who seeks admission to a Ph.D.-granting graduate program or seeks employment in industry. Due to the high impact of undergraduate research experiences, we continue to promote these experiences both during the summer (SURE program) and academic year (PHYS 399 or 499), and to support travel of students to professional meetings to present their research.

2) **findings-based plans and actions intended to improve student learning and/or success (expansion of Part 1a, box e as needed)**

Based on previous findings, the current sophomore-level course sequence (PHYS 215/L and 216/L) will be replaced starting in AY2020-21 with a new sophomore-level sequence (PHYS 306, 307, 308, and 308L). We believe these new courses—with updated laboratory content, a greater focus on applied problem solving, and more focused Modern Physics topics—will better prepare students for graduate school or careers in industry. Also see Part 1a, box e above.

3) **what your assessment plan will focus on in the coming year**

Next year we will assess Outcome #1 (knowledge of fundamental concepts) and Outcome #2 (problem-solving skills). Given the program changes notes above in 2), we will be looking for improvements in problem-solving skills as a result of these changes. Regarding Outcome #1, the Majors Field Test (Physics) is used to assess knowledge of

fundamental concepts; at this point enough data has accumulated for the national level test to begin reporting scores with the new test and scoring formats. We anticipate comparing our students' performance to this new national data.

4) how this information will be shared with other stakeholders

Upon completion this report will be submitted to the Chairperson of the Department of Chemistry and Physics (Jennifer Inlow) who will, upon her approval, forward it to the Dean of the College of Arts and Sciences and subsequently the Office of Assessment for review. Once approved by the Chairperson, information contained in this assessment report will be discussed at a departmental meeting in Fall 2020. Feedback from this assessment cycle will also be addressed at future departmental assessment committee meetings as well as departmental meetings of the full faculty. Interested faculty will be encouraged to assist in gathering data for future assessment cycles. This report will be posted on our departmental Blackboard site so all physics faculty can review it at any time.

Thank you so much for sharing your assessment process and findings for AY 2019-20 with the Assessment Council. You will find feedback and ratings on the rubric below. It is understood that some of the feedback might encompass practices that you already engage in but were not documented in this report. As the purpose of this evaluation is focused on recognizing great work and helping faculty improve assessment practice, it is not necessary to retroactively add documentation. Please feel free to let me know if you have any questions or if there is any way I can assist you in further developing assessment practice and use in your program.

This report will be shared with the Associate Dean(s) and Dean of your college and summarized findings will be shared as composite college/institutional data with the President's Office and the Provost's team.

Sincerely,

Kelley (x7975)

Program: B.S. Physics	**Overall Rating: Exemplary (3.00/3.00)**
Strengths	**Recommendations**
• Learning outcomes are clear, specific, and measureable. • Measures of student learning are tied to each outcome and include problem-based, hands-on learning that ties knowledge and skills together in application. Data from measures comes from multiple courses and is evaluated by faculty on a common rubric. • Expectations for student learning are clear and reasonable. • Data is clearly reported with significant detail for faculty interpretation of results. • Discussion of findings provides a deep, thoughtful analysis of student learning and how assessment is best used internally to drive improvement and support continuing strong practice. Detailed notes are included about curricular changes and the assessment plans to address learning in the coming year. • Assessment is clearly a shared and transparent practice among faculty, and findings are put to use and shared throughout the cycle.	•

Student Outcomes Assessment & Success Report Rubric **Unit/Program: BS Physics**
Office of Assessment & Accreditation, Indiana State University **Evaluation Date: Fall 2020**

Evaluation Criteria	3 Exemplary	2 Mature	1 Developing	0 Undeveloped
Student Learning Outcomes	Identified, aligned learning outcomes are specific, measurable, student-centered, and program-level. Outcomes directly integrate institution or college-level learning goals. Outcomes are consistent across modes of delivery (if applicable). More than one outcome is assessed this cycle, and rationale is provided for why they were selected for assessment.	Identified, aligned learning outcomes are specific, measurable, student-centered, and program-level. Outcomes support institution or college-level learning goals. Outcomes are consistent across modes of delivery (if applicable). At least one outcome is assessed this cycle, and rationale is provided for why it was selected for assessment.	Learning outcomes are identified and alignment with courses is demonstrated. Outcomes are consistent across modes of delivery (if applicable). At least one outcomes is assessed this cycle.	No ***(program)*** learning outcomes are identified, and/or alignment of learning outcomes to courses is not demonstrated (e.g. – curriculum map).
Performance Goals & Measures	Performance goals are clear and appropriate, and rationale is provided for why these were selected. Identified measures and tools are assigned to each outcome, are clear and intentionally designed to address student performance on aligned outcomes, and rationale and examples are provided (e.g. – rubrics, checklists, exam keys). Most are direct measures, and their design enhances the validity of findings. Licensure exams and high-impact practices are reflected in measures (if applicable).	Performance goals are clear and appropriate. Identified measures and tools are assigned to each outcome, are clear and intentionally designed to address student performance on aligned outcomes, and examples are provided (e.g. – rubrics, checklists, exam keys). At least one direct measure is included.	Performance goals are identified with little rationale or clarity. Identified measures are poorly suited to performance goals, underdeveloped, or are solely indirect measures.	No goals for student performance of learning outcomes are identified, and/or no measures are provided.

Analysis & Results	Data collection process is clear and designed to produce valid/trustworthy results. The process is useful to those collecting and/or interpreting data. Data is collected and analyzed with clear rationale and description. Results are provided with thoughtful discussion of analysis and description of conclusions that can be drawn.	Data collection process is clear and designed to produce valid/trustworthy results. Data is collected and analyzed with clear rationale and description. Results are provided with some discussion of analysis.	Description of data collection is unclear as to process and quality. Some data is collected and analyzed with little rationale or description. Some results are provided with no discussion of analysis.	No information is provided about the data collection process, and/or no data is being collected. No results are provided
Sharing & Use of Results for Continuous Improvement	A plan for sharing information and included program faculty and appropriate staff in discussion and planning is detailed and enacted. Outcomes and results are easily accessible on the program website or other appropriate designated area. Plans for improvement or change based on results are clear and connected to results. If few students met performance goals, this is included in discussion and plans. Reflection if offered about results or plans moving forward, and compares prior year plans to current outcomes in an effort to foster continuous improvement as a result of assessment process.	A plan for sharing information broadly across program faculty is detailed and enacted. Plans for improvement or change based on results are clear and connected to results. If few students met performance goals, this is included in discussion and plans. Reflection is offered about results or plans moving forward.	Information is provided about sharing results, but sharing is limited in scope or content. Plans for improvement or change based on results are incomplete, vague, or not clearly connected to results. Little reflection is offered about results or plans moving forward.	No information is provided about sharing results and/or plans for improvement or change based on results. No evidence of reflection on results in provided.
Overall Rating	□ **Exemplary**	□ **Mature**	□ **Developing**	□ **Undeveloped**

Please see reviewer notes for more details.