SAINT LOUIS UNIVERSITY.

Program-Level Assessment: Annual Report

Program Name (no acronyms): Physics BS	Department: Physics
Degree or Certificate Level: BS	College/School: SSE
Date (Month/Year): August 15th, 2023	Primary Assessment Contact: Dr. Irma Kuljanishvili Additional contact: Dr. David S Wisbey

In what year was the data upon which this report is based collected? 2022/2023

In what year was the program's assessment plan most recently reviewed/updated? 2021

1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle? (Please list the full, complete learning outcome statements and not just numbers, e.g., Outcomes 1 and 2.)

In accordance with the schedule set by the assessment plan the following three outcomes were assessed: In 2022/2023, items 1, 2, & 3 were assessed (see Appendix 2 for more detailed description of Outcomes 1-3).

Outcome 1. Students will apply the principles of physics to problems of fundamental and practical interest.
Outcome 2. Students will design and conduct experiments and analyze and interpret data.
Outcome 3. Students will collaborate effectively in teams.

2. Assessment Methods: Artifacts of Student Learning

Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe and identify the course(s) in which these artifacts were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

Student assignments, laboratory reports, written term paper, and students' oral presentation were used to determine if students achieved these specific outcomes. The following courses were used to collect data for the assessment process: Classical Mechanics, Electricity and Magnetism, Quantum Mechanics, Optics, Optics Lab, Analog and Digital Electronics, Nanoscience Frontiers, Experimental Physics, and the Modern Physics Lab. All courses were offered in person.

3. Assessment Methods: Evaluation Process

What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and **include them in/with this report document** (do not just refer to the assessment plan).

Faculty evaluated artifacts collected in courses they taught using the rubrics in Appendix 1. Physics Faculty met in May 2023 for Annual Assessment meeting. Each Faculty provided feedback based on each faculty observations and their evaluations of student's artifacts such as lab reports, tests, term papers, oral presentations. Evaluations were ranked per specific Learning Outcome and approved rubric.
Rubric is provided in Appendix 1.
Summary of the data is provided in Appendix 2.

4. Data/Results

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

Results in general indicate that students in the program meet/exceeds expectation.
In this year's assessment report we found that we are meeting expectations in all categories. In outcome 1 and 3, we are exceeding expectations. Since outcome 2 was close to meeting expectations, this is an area that could be improved.
All courses used in the assessment were offered in person and generally had good results.

(See Appendix 2:
Outcome 1, Average = 3.54
Outcome 2, Average = 3.13
Outcome 3, Average =3.55).
One individual scored below 3 which indicates "Progressing towards expectation".

5. Findings: Interpretations & Conclusions

What have you learned from these results? What does the data tell you?

Student have the opportunity to apply the principles of physics to solve problems. They also have ample opportunities to work in teams. In both of these areas students are close to exceeding expectations. In the area of designing and conducting experiments and analyzing data from those areas, students are meeting expectations. It was found some students needed more experience analyzing data. They could benefit from understanding the connection between theory and experiment. Being able to draw accurate conclusions from experimental data is something that all students could benefit from.

6. Closing the Loop: Dissemination and Use of Current Assessment Findings

A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

Faculty met in May, 2023, and discussed and provided data on learning outcomes 1, 2, and 3. Data was compiled during summer 2022. Faculty will meet in November to discuss minor changes that will be implemented in the next cycle.

This report will be sent to the Associate Dean/s of SSE and Merisa Cope, Assessment Director, Office of the Provost, Saint Louis University and will eventually be posted on the website and made available to faculty, staff, students, and alumni.

B. How specifically have you decided to use these findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies	• Course content • Teaching techniques • Improvements in technology • Prerequisites	• Course sequence • New courses • Deletion of courses • Changes in frequency or scheduling of course offerings
Changes to the Assessment Plan	• Student learning outcomes • Artifacts of student learning • Evaluation process	• Evaluation tools (e.g., rubrics) • Data collection methods • Frequency of data collection

Please describe the actions you are taking as a result of these findings.

Changes to the Assessment Plan;
Because some classes that are assessed in our program are only offered every other year, we will switch the assessment sequence to match those classes in the year they are offered. Changes in frequency of some course offerings related to the new core, or introduction of new courses related to reorganization of the program course requirements, will be discussed in Fall 2022.

Going forward, we will add the courses Research II and Research III to item 2. This will allow us to determine if students are able to conduct data analysis.

Changes to Curriculum;
Students will be encouraged and continue to take additional scientific programming classes as an elective in order to gain more programming experience which could advance students' marketability and employment opportunities. In the fall 2023 the program requirements for the BS Physics will be updated to accommodate more scientific programming. Also, more opportunities for programming were included in existing classes such as both courses PHYS4020 Experimental Physics and PHYS4010 Nanoscience Frontiers.

In order to better monitor students' progress in analyzing data, required research experience courses such as Research 2 and Research 3 will be included in the assessment plan. These changes will be used to see if students understand the data they are generating. The physics department will meet in the fall to discuss what further actions can be taken to improve data analysis and experimental design. (Plan is to be updated in Dec 2023).

Results for items 1 and 3 were very close to exceeding expectations. Item 2, students will design and conduct experiments and analyze and interpret data, was closer to meeting expectations.

1.Below Expectations
2.Progressing to Expectations
3.Meets Expectations
4.Exceeds Expectations

If no changes are being made, please explain why.

NA see item 6

7. Closing the Loop: Review of Previous Assessment Findings and Changes

A. What is at least one change your program has implemented in recent years as a result of assessment data?

We have added one additional course to be assessed under outcome 1. We reduced the number of years to complete the full cycle of assessment from three years to two years. Two additional courses, Research 2 and 3 will possible be added following our fall assessment meeting with the department. Faculty will develop a plan for improving this area. Faculty will be encouraged to meet with students regularly and go over their data and what it means. Also how their projects are connected to experimental results when appropriate.

B. How has this change/have these changes been assessed?

Same assessment rubric was applied. In year 2021 we completed a full cycle of assessment. In this reporting period year 2002/2023 we assessed Outcomes 1,2,3 a new first year of a two-year cycle.

C. What were the findings of the assessment?

In the fall 2022/ spring 2023 assessment year we have found that students in the program may benefit from continued increased exposure to scientific programming. Additionally, possibly more collaborative team learning and in-class course training, especially in the context of multidisciplinary projects and teams would further benefit students.

D. How do you plan to (continue to) use this information moving forward?

The department will meet and discuss these findings in Fall 2023. During this meeting, the department will formulate an update the assessment plan to address possible changes to the curriculum and/or program requirements. Students will be further encouraged to take additional programming courses. Scientific programming will continue to be included in several courses including Analog and Digital Electronics, Experimental Physics, and Nanoscience Frontiers, and possibly other new courses which are planned to be developed.

IMPORTANT: Please submit any assessment tools (e.g., rubrics) with this report as separate attachments or copied and pasted into this Word document. Please do not just refer to the assessment plan; the report should serve as a stand-alone document.

Appendix 1

Physics Assessment Rubrics

Outcome\Level of Attainment	1.Below Expectations	2. Progressing to Expectations	3. Meets Expectations	4. Exceeds Expectations
1. Students will apply the principles of physics to problems of fundamental and practical interest.	Not able to apply physics principles.	Can apply physics principles to simple problems with guidance.	Can apply physics principles to problems of increasing complexity	Can apply physics principles to problems beyond the classroom
2. Students will design and conduct experiments and analyze and interpret data.	Not able to conduct experiments or analyze data	Can conduct experiments and analyze data with direction	Can design and conduct experiments and analyze data with minimal direction	Can design and conduct experiments and analyze data independently. Demonstrates innovative thinking.
3. Students will collaborate effectively on teams.	Does not work well in groups	Contributes minimally to the efforts of a group	Participates actively in various aspects of group work	Works productively in groups, and inspires others
4. Students will communicate effectively and professionally in oral and written formats	Unable cogently to express ideas orally and in writing	Able to express simple ideas with some clarity	Able to express complex ideas with clarity	Able to express complex ideas with clarity and make connections among related ideas
5.Students will be able to discuss contemporary issues in science	Not able to discuss contemporary scientific and	Able to discuss such issues with guidance.	Able to discuss such issues on his/ her own clearly and	Has a broad knowledge of current issues and conveys

and technology	technological issues in context.		concisely	ideas clearly and concisely.
6.Students will be able to formulate numerically and solve scientific problems utilizing at least one programing language or environment	Not able to formulate a scientific problem as a set of numerical steps; and not able to produce code to solve it	Able to convert a scientific problem into numerically accessible steps with some assistance, code it and obtain results	Able to convert a scientific problem into numerically accessible steps, code it and obtain results. Investigate results and analyze errors.	Able to convert a scientific problem into numerically accessible steps, providing multiple alternative routes, code them and obtain results. Investigate results and analyze errors and optimize approaches.

Appendix 2: 2021/2022 Data

Outcome\Level of Attainment	Results
1. Students will apply the principles of physics to problems of fundamental and practical interest.	E&M AL -4 CN- 3 Optics (PHYS 3310): BA 4 AL 4, ML 4, GO 3, AS 3, HS 2, SG 3 Classical Mechanics NS 4, ZW 4 Quantum AL 4 HS 4 Average: 3.54
2. Students will design and conduct experiments and analyze and interpret data.	EP: JA 2, AL 4, GO 4, AS 3, HS 2 A&DL23: JA 2 AL 4 GO 3 AS 3 A&DL22: AB 4, NG 3, SK 4, CML 3, HS 2, NT 3, PV 4 Average: 3.13
3. Students will collaborate effectively in teams.	EP: JA 4, AL 4, GO 4, AS 4, HS 3 JA 4 AL 4 GO 4 AS 4 HS 3 NS 4 EM 4 WZ 3 Optics Sp23 (PHYS 3310): AB4, LA4, LM4, OG3, AS3, SH2, GS2 Optics Lab Sp 2023 ML 4.0, BA 4.0 , AS 4.0, AL 4.0, HS 3.0, GO 3.0, Nano Science Frontiers ML4.0, NA 4.0, AS 3.0, HS 3.0, GO 3.0 Average: 3.55