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 19th, 2022	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? 2021/2022

In what year was the program's assessment plan most recently reviewed/updated? 2020

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 2021/2022, items 4, 5, & 6 were assessed (see Appendix 2 for more detailed description of Outcomes 1-6).

Outcome 4. Students will communicate effectively and professionally in oral and written formats
Outcome 5. Students will be able to discuss contemporary issues in science and technology
Outcome 6. Students will be able to formulate numerically and solve scientific problems utilizing at least one

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: Modern Physics I, Optics, Optics Lab, Modern Physics Lab, Atomic, Molecular and Solid-State Physics (formally Modern Physics II), Analog and Digital Electronics & Lab, Experimental Physics, and Research I, Research II, and Research III. (Three semester sequence of undergraduate research course). All courses were offered in person.

In Research I, II, and III students complete a research project encompassing at least three semesters of research at the conclusion of which they give an oral presentation in a department seminar. At the end of the seminar the physics faculty meet to discuss and assess students' oral presentations.

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 on June 10, 2021 for Annual Assessment meeting. Each Faculty provided feedback based on each faculty observations

and their evaluations of students artifacts such as 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 the achieved results were not significantly different, (averaged scores were very comparable) from previous years 2020/2021.
Additionally, in spite of different modalities that individual courses used, all laboratory and project experimental courses were still offered 100% in-person, assessments results were steady and positive. This is, in part, due to the specific outcomes that were assessed in 2021/2022.
Senior Capstone courses, Research II & III, had the final presentations via Zoom. Specifically, in oral presentations students did as well as it would be expected in face- to- face class presentation. In assessment of communications in writing, the same was noted. There was no statistically viable difference noted in written test and assignments.

(See Appendix 2:
Outcome 4, Average = 3.69
Outcome 5, Average = 3.77
Outcome 6, Average =3.36).
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?

The physics program provides outlets for students to learn and apply their knowledge. Research projects and written papers and oral presentations related to Senior Capstone research courses have greatly benefited from close Instructor-Student interaction and teamwork in cases where students are engaged in complex projects with multiple team members. Lessons learned during the previous year (Academic year 2020/2021) of online learning due to COVID-19 generally improved communication using online platforms such as Zoom.

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 on May 19th, 2022, and discussed and provided data on learning outcomes 4, 5, and 6. Data was compiled during summer 2022. Faculty met on August 19th and discussed minor changes that will be implemented in Fall 2022. A) Learning assessment should better match the cycle of class being offered. B) Assessment analysis indicated that students could benefit from additional computer programming experience.

This report will be sent to the Associate Dean/s and will eventually be posted on the website
http://www.slu.edu/the-office-of-the-provost/assessment-of-student-learning/program-level-assessment/college-of-arts-and-sciences
where it can be viewed by 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.

Changes to Curriculum;
Students will be encouraged 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 2022 the program requirements for the BS Physics will be updated to accommodate more scientific programming.

The results for Outcomes 4 and 5 were very close to "exceeding expectations" (3.69 and 3.77 respectively). For Outcome 6 the calculated average was 3.36 which indicates that we are meeting expectations. During our faculty meeting in the fall 2022, the department will develop a plan for improving the score for Outcome 6. This will involve finding new way to incorporate more programming and computationally oriented courses into curriculum. While we are meeting the expectations for learning Outcome 6 in this present assessment cycle determined in our assessment plan, these changes will bring us closer to exceeding expectations.

It was also suggested by some faculty that in the updated assessment plan should include an updated rubric to evaluate scientific and technical writing.

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.

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

Same assessment rubric was applied. In year 2022 we completed a full cycle of assessment.

C. What were the findings of the assessment?

In the fall 2021/ spring 2022 assessment year we have found that students in the program may benefit from increased exposure to scientific programming.

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

The department will meet and discuss these findings in Fall 2022. During this meeting, the department will formulate an update the assessment plan to address possible changes to the curriculum and/or program requirements. The assessment plan will be updated accordingly.

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 and technology	Not able to discuss contemporary scientific and technological issues in context.	Able to discuss such issues with guidance.	Able to discuss such issues on his/ her own clearly and concisely	Has a broad knowledge of current issues and conveys ideas clearly and concisely.
6.Students will be	Not able to	Able to convert a	Able to convert	Able to convert a

able to formulate numerically and solve scientific problems utilizing at least one programing language or environment	formulate a scientific problem as a set of numerical steps; and not able to produce code to solve it	scientific problem into numerically accessible steps with some assistance, code it and obtain results	a scientific problem into numerically accessible steps, code it and obtain results. Investigate results and analyze errors.	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
4. Students will communicate effectively and professionally in oral and written formats	Modern Physics I (PHYS 2610): AL 4, BA 4, JM 3 Modern Physics II/ Atomic, Molecular and Solid-State Physics (PHYS 3610): NG 4, GO 3, AS 4, HS 3, NT 4 Optics (PHYS 3310): SK 4, NG 3 Optics Lab (PHYS 3320): SK 4, NG 3, Y.M. 3 Nanoscience Frontiers (PHYS 4010): No BS Physics Majors Physics Research I, II, or III (PHYS 3860, PHYS 4870, PHYS 4880): PRIII: YM 4, PRI: GO 4, AS 4 Average: 3.69
5.Students will be able to discuss contemporary issues in science and technology	Modern Physics I(PHYS 2610): AL 4, BA 4, JM 3 Modern Physics II / Atomic, Molecular and Solid-State Physics (PHYS 3610): NG 4, GO 3, AS 4, HS 3, NT 4 Optics (PHYS 3310): SK 4, NG 4 Nanoscience Frontiers (PHYS 4010): No BS Physics majors Physics Research I, II, or III (PHYS 3860, PHYS 4870, PHYS 4880): PRIII: YM 4, PRI: GO 4, AS 4 Average: 3.77
6.Students will be able to formulate numerically and solve scientific problems utilizing at least one programing language or environment	Analog and Digital Electronics (PHYS 3510): AB 4, GN 2, AL 4, MJ 4, SH 2, CM 4, SK 4, NT 4, PV 4 Modern Physics Lab (PHYS 2620): AB 4, GN 2, AL 4, MJ 4, SH 2 Optics Lab (PHY S3320): SK 4, NG 3, Y.M. 3 Physics Research I, II, or III (PHYS 3860, PHYS 4870, PHYS 4880): PRIII: YM 4, PRI: GO 3, AS 3 Experimental Physics (PHY S4020): TM 3, DM 3, FS 4, NT 2, PV 4

	Average: 3.36