UNIT REPORT

Physics-Academic - APR Self-Study Report by Academic Unit/Department

Generated: 3/15/22, 3:36 PM

Program Mission

Physics Department Mission Statement

Program Mission Statement:

Deliver high quality undergraduate and graduate programs in Physics through course work and research experiences that broadly prepare students for employment, further formal study, and life-long learning, with emphases available in both applied and fundamental areas. Conduct research at the frontiers of knowledge in a wide spectrum of disciplines, including astrophysics, biophysics, condensed matter physics, nuclear physics, photonics, physics of materials, and planetary science. Serve the campus, community and state as a resource for information and technical expertise with particular support for colleagues in science education at all levels. Promote the development, understanding and appreciation of physics, and science in general, through delivery of general education courses and research presentations and through service to professional organizations and agencies. Conduct all aspects in a welcoming, inclusive, unbiased manner that embraces and celebrates diversity.

Program Goal (add a minimum of 3 program goal "plan items")

#1 Deliver high quality undergraduate and graduate programs in Physics

Goal Statement:

Prepare students for meaningful employment, further formal study, and life-long learning.

Alignment to UI Strategic Plan Goals:

Engage (Goal 2): Suggest and influence change that addresses societal needs and global issues, and advances economic development and culture.
Transform (Goal 3): Increase our educational impact.

Indicators/Metrics to Evaluate Progress:

Total number of majors and annual number of graduates in each program. GPA of graduating seniors. Number of undergraduates engaged in research.

List of Actions the Program Will Take to Achieve Goals :

Monitor curriculum content and research engagement. Advertise opportunities for elective courses and research projects. Recruit undergraduate and graduate students with interest and ability.

Goal Achievement Level: In Progress

#2 Conduct research at the frontiers of knowledge

Goal Statement:

Focus on current areas of faculty expertise (astrophysics, biophysics, condensed matter physics, nuclear physics and planetary science) to foster research productivity and student involvement.

Alignment to UI Strategic Plan Goals:

Innovate (Goal 1): Scholarly and creative products of the highest quality and scope, resulting in significant positive impact for the region and the world.

Indicators/Metrics to Evaluate Progress:

Publications in refereed journals. Contributions to national and international conferences. Research funding and F&A return. Number of postdoctoral, graduate, and undergraduate research assistants.

List of Actions the Program Will Take to Achieve Goals :

Apply for funding at every opportunity that is consistent with faculty research goals and time commitments. Set intermediate goals that lead to publications at each stage of a project. Recruit students and develop hierarchical research teams for larger projects. Attain a sufficiently high profile to be invited for conference presentations.

Goal Achievement Level: In Progress

#3 Expand the participation of underrepresented groups.

Goal Statement:

Conduct all programs and research activities in a welcoming, inclusive, unbiased manner that embraces and celebrates diversity.

Alignment to UI Strategic Plan Goals:

Cultivate (Goal 4): Foster an inclusive, diverse community of students, faculty, and staff and improve cohesion and morale.

Indicators/Metrics to Evaluate Progress:

Numbers of students from underrepresented groups in the majors and graduating with Physics degrees.

List of Actions the Program Will Take to Achieve Goals :

Engage with the College of Science Diversity Committee. Manage recruitment to programs and research projects in an inclusive manner. Post an inclusivity statement on the department web page.

Goal Achievement Level: In Progress

Student Learning Assessment Report (add one "plan item" for each major, degree, and/or certificate offered by dept)

Physics BA

Assessment Report Contact: John Hiller

Program Changes in Past Year:

None

Learning Outcomes are Communicated to All Students in Program (check box if true): true

Learning Outcomes are Communicated to All Faculty (check box if true): true

Optional: Framework Alignment:

Import Outcomes Data (from Anthology Outcomes):

Need to develop a new approach to assessment of communication and research skills. A new course Phys 401 Seminar is under development and evaluation of Phys 200 will be undertaken to fill the 'communication' gap. A scheme for a combined assessment of research performance in Phys 490 and 492 will be prepared for the next assessment period.

1.

Basic Skills

Students will be able to apply concepts and methods from a range of sub-disciplines of physics and some advanced topics in physics, such as astrophysics and computational physics.

Academic Year 2020-2021: Physics (B.A.)

Term: Overview

Exceeded	45.76%	27
Met	27.12%	16
Partially Met	18.64%	11
Not Met	8.47%	5

Summary of Student Learning:

Some students are performing below the level necessary for success in the program.

Summary of Faculty Discussion:

Presented in 'Summary Findings' and 'Closing the Loop'.

Summary of Changes/Improvements Being Considered:

None

Inter-rater Reliability:

Learning outcomes discussed extensively among faculty in preparation of assessment plan.

Closing the Loop:

Adjustments in prerequisites and content for course sequences are under discussion, particularly for Phys 351. A new course, Phys 401 Seminar, will be added to the program.

Physics BS General Emphasis

Assessment Report Contact: John Hiller

Program Changes in Past Year:

None.

Learning Outcomes are Communicated to All Students in Program (check box if true): true

Learning Outcomes are Communicated to All Faculty (check box if true): true

Optional: Framework Alignment:

Import Outcomes Data (from Anthology Outcomes):

Need to develop a new approach to assessment of communication and research skills. A new course Phys 401 Seminar is under development and evaluation of Phys 200 will be undertaken to fill the 'communication' gap. A scheme for a combined assessment of research performance in Phys 490 and 492 will be prepared for the next assessment period.

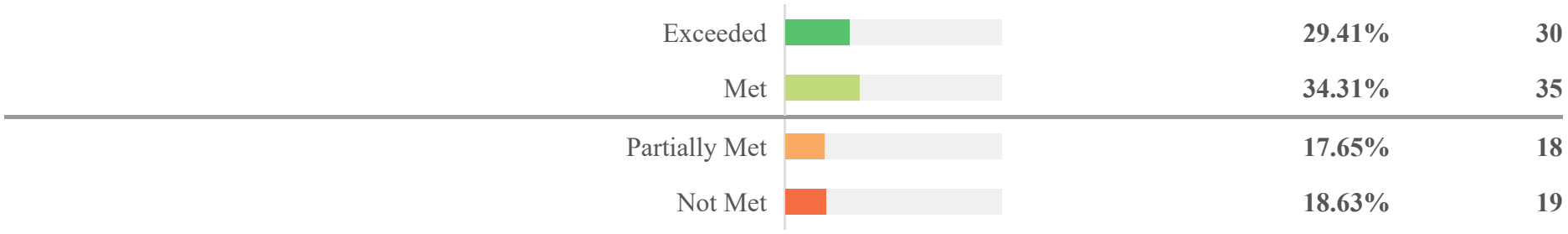
1.

Basic Skills

Students will be able to apply concepts and methods in the various sub-disciplines of physics. They have mastered the principles of mechanics, quantum mechanics, electromagnetic fields, thermal statics, and some advanced topics in physics, such as astrophysics and computational physics.

Academic Year 2020-2021: Physics - General Physics Emphasis (B.S.)

Term: Overview



Summary of Student Learning:

Some students are performing below the level necessary for success in the program.

Summary of Faculty Discussion:

Presented in 'Summary Findings' and 'Closing the Loop'.

Summary of Changes/Improvements Being Considered:

None

Inter-rater Reliability:

Learning outcomes discussed extensively among faculty in preparation of assessment plan.

Closing the Loop:

Adjustments in prerequisites and content for course sequences are under discussion, particularly for Phys 351. A new course, Phys 401 Seminar, will be added to the program.

Physics BS Applied Emphasis

Assessment Report Contact: John Hiller

Program Changes in Past Year:

None

Learning Outcomes are Communicated to All Students in Program (check box if true): true

Learning Outcomes are Communicated to All Faculty (check box if true): true

Optional: Framework Alignment:

Import Outcomes Data (from Anthology Outcomes):

Need to develop a new approach to assessment of communication and research skills. A new course Phys 401 Seminar is under development and evaluation of Phys 200 will be undertaken to fill the 'communication' gap. A scheme for a combined assessment of research performance in Phys 490 and 492 will be prepared for the next assessment period.

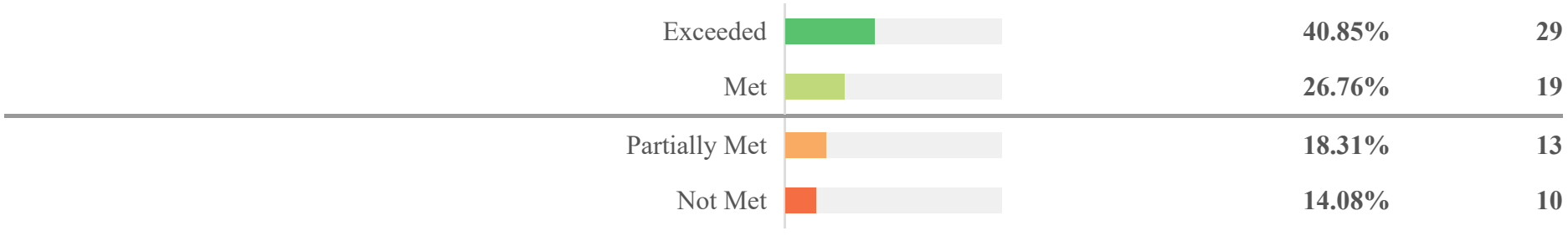
1.

Basic Skills

Students will be able to apply concepts and methods in the various sub-disciplines of physics relevant to their interests and in advanced topics in physics and engineering.

Academic Year 2020-2021: Physics - Applied Physics Emphasis (B.S.)

Term: Overview



Summary of Student Learning:

Some students are performing below the level necessary for success in the program.

Summary of Faculty Discussion:
Presented in 'Summary Findings' and 'Closing the Loop'.

Summary of Changes/Improvements Being Considered:
None

Inter-rater Reliability:
Learning outcomes discussed extensively among faculty in preparation of assessment plan.

Closing the Loop:
Adjustments in prerequisites and content for course sequences are under discussion, particularly for Phys 351. A new course, Phys 401 Seminar, will be added to the program.

To help increase participation in the program, the course content will be broadened beyond engineering applications to include other sciences.

Physics MS

Assessment Report Contact: John Hiller

Program Changes in Past Year:
None

Learning Outcomes are Communicated to All Students in Program (check box if true): true

Learning Outcomes are Communicated to All Faculty (check box if true): true

Optional: Framework Alignment:

Import Outcomes Data (from Anthology Outcomes):
Need to develop a new approach to assessment of research skills. A scheme for a combined assessment of research performance in Phys 500 and 599 will be prepared for the next assessment period.

1.

Basic Skills

Students acquire advanced knowledge through upper-level course work and, for the thesis option, through the completion of a meaningful research project.

Academic Year 2020-2021: Physics (M.S.)

Term: Overview

Exceeded	19.05%	4
Met	42.86%	9
Partially Met	33.33%	7
Not Met	4.76%	1

2.

Communication Skills

Students will be able to present their research in a clear and organized fashion at conferences and colloquia.

Academic Year 2020-2021: Physics (M.S.)

Term: Overview

Exceeded	0%	0
Met	100%	3
Partially Met	0%	0
Not Met	0%	0

Summary of Student Learning:
Some students are performing below the level necessary for success in the program, as also indicated by some failures in the written preliminary ('qualifying') exam required for the non-thesis MS.

Summary of Faculty Discussion:
Presented in 'Summary Findings' and 'Closing the Loop'.

Summary of Changes/Improvements Being Considered:
None.

Inter-rater Reliability:
Learning outcomes discussed extensively among faculty in preparation of assessment plan.

Closing the Loop:

Instructors of the graduate core courses will consider a reduced use of take-home exams, in order to better prepare students for the in-person written preliminary ('qualifying') exam. Student progress in the core courses will be more closely monitored by the Academic Standards Committee, to facilitate corrective interventions.

Physics PhD

Assessment Report Contact: John Hiller

Program Changes in Past Year:
None

Learning Outcomes are Communicated to All Students in Program (check box if true): true

Learning Outcomes are Communicated to All Faculty (check box if true): true

Optional: Framework Alignment:

Import Outcomes Data (from Anthology Outcomes):
Need to develop a new approach to assessment of research skills. A scheme for a combined assessment of research performance in Phys 599 and 600 will be prepared for the next assessment period.

1.

Basic Skills

Students will be able to apply concepts and methods from a broad and comprehensive knowledge of physics, and in-depth knowledge of a specific discipline, such as astronomy, biophysics, computational physics, nuclear physics theory, or condensed matter physics.

Academic Year 2020-2021: Physics (Ph.D.)

Term: Overview

Exceeded	21.43%	6
Met	39.29%	11
Partially Met	28.57%	8
Not Met	10.71%	3

2.

Communication Skills

Students will be able to articulate their work in written and oral forms, as well as defend their research protocols, data analysis, and conclusions. In addition, they should be able to communicate scientific principles, including their own results, to a knowledgeable, but not necessarily expert, audience.

Academic Year 2020-2021: Physics (Ph.D.)

Term: Overview

Exceeded	0%	0
Met	100%	3
Partially Met	0%	0
Not Met	0%	0

Summary of Student Learning:

Some students are performing below the level necessary for success in the program, as also indicated by some failures in the written preliminary ('PhD qualifying') exam.

Summary of Faculty Discussion:

Presented in 'Summary Findings' and 'Closing the Loop'.

Summary of Changes/Improvements Being Considered:

None.

Inter-rater Reliability:

Learning outcomes discussed extensively among faculty in preparation of assessment plan.

Closing the Loop:

Instructors of the graduate core courses will consider a reduced use of take-home exams, in order to better prepare students for the in-person written preliminary ('PhD qualifying') exam. Student progress in the core courses will be more closely monitored by the Academic Standards Committee, to facilitate corrective interventions.

Student Achievement

Student Achievement

Student Retention:

The programs are small enough to allow progress to be monitored at the individual level and to simply examine lists of students in each program. Retention from semester to semester is approximately 90% for undergraduates and nearly 100% for graduate students.

Student Persistence:

There are 56 undergraduates and 24 graduate students. The total number of undergraduates has been steadily declining at a rate of 10 per year; the number of graduate students has been stable, at a number set by the available funding. (Physics students rarely enroll in a physics graduate program at their own expense.) The number of graduate students will increase only with increased funding.

The undergraduate programs are challenging, with many freshman coming unprepared for the required rigor, particularly with respect to mathematics. Increased recruiting efforts are in place, to provide balance to losses when students change majors. Also, the Applied Physics emphasis for the BS is to be broadened, to capture a greater range of student interests.

Student Completion:

Undergraduate completion is monitored as a part of the scholarship and graduation award decisions made each year in the spring semester. The record of each student approaching graduation is examined closely. Graduate students are monitored on an individual basis by their major professors.

Student Postgraduate Success:

Graduated students report being satisfied or very satisfied overall, with good to excellent faculty student interaction, according to the GSS. The department produces an annual newsletter distributed to all alumni with opportunities for response with career updates; it serves as a de facto survey of the entire population.

The one negative item in the GSS is the opinion of course availability. This indicates a need for more careful advising as students progress through the programs, given that funding levels do not allow course availability to be increased.

Identify Equity Gaps:

The numbers in the programs are too small to identify statistically significant gaps.

Effective Learning Environment and Closing Equity Gaps:

Engage with CETL to broaden delivery methods, particularly with the greatly increased availability of technology that came with the pandemic.

Demand and Productivity

Demand and Productivity

External Demand:

The APR dashboard does not provide historical data. However, the general trend has been a reduction in the number of undergraduate majors and a steady number of graduate students. The number of admitted students is actually quite high (approximately 50) and more aggressive recruiting has been undertaken to increase the number enrolled. The Applied Physics emphasis will be expanded to a broader set of applied areas, to attract a larger number of students, particularly double majors. There will also be purchases of lists of interested h.s. students from neighboring states, to increase the number of admitted physics majors.

For the graduate programs, the key is availability of TA and RA funding. The number of applicants and even the number of admitted students is much higher than the department's ability to provide the funding necessary to attract enrolled students. Expanded external funding will be sought.

Internal Demand:

Steady credit hour production, dominated by students from other majors who need physics courses as prerequisites or as general education. Credit hours generated by physics majors and graduate students are a small part of the total.

Credit Productivity:

The department has carried out steps to improve lab experiments for better learning and better student engagement, and continues to explore improvements. Various resources, such as tutoring and supplemental instruction (SI-PASS), are promoted and advertised extensively to keep students supported in their efforts for success.

Financial Health and Resources

Financial Health and Resources

Financial Health:

Sufficient resources are available to deliver programs, with well-funded gift accounts to fill any temporary gaps and provide a large number of scholarships. Considerable external funding has been obtained, sufficient to support at least half of the graduate students as RAs and partially support some undegraduates.

Efficient Use of Resources:

Careful monitoring by the Chair and the Admin Assistant. Any large purchases or needs are brought to the faculty as a whole.