Program Assessment Plan

Program: Physics BS

Department: Physics

College/School: Parks

Date: December 22, 2017

Primary Assessment Contact: William D. Thacker

Note: Each cell in the table below will expand as needed to accommodate your responses.

#	Program Learning Outcomes	Assessment Mapping	Assessment Methods	Use of Assessment Data
#	**Program Learning Outcomes** What do the program faculty expect all students to know, or be able to do, as a result of completing this program? ▪ *Note: These should be measurable, and manageable in number (typically 4-6 are sufficient).*	**Assessment Mapping** From what specific courses (or other educational/professional experiences) will artifacts of student learning be analyzed to demonstrate achievement of the outcome? Include courses taught at the Madrid campus and/or online as applicable.	**Assessment Methods** What specific artifacts of student learning will be analyzed? How, and by whom, will they be analyzed? ▪ *Note: the majority should provide direct, rather than indirect, evidence of achievement.* Please note if a rubric is used and, if so, include it as an appendix to this plan.	**Use of Assessment Data** How and when will analyzed data be used by faculty to make changes in pedagogy, curriculum design, and/or assessment work? How and when will the program evaluate the impact of assessment-informed changes *made in previous years*?
1	Students will apply the principles of physics to problems of fundamental and practical interest.	Classical Mechanics I & II, Quantum Mechanics I&II, Electricity and Magnetism I&II, Optics; research	Student performance on specific assignments in listed courses assessed by course instructor according to outcome-specific rubric listed below.	In annual department meetings assessment results at individual level and in aggregate, corrective action for weaknesses in student attainment, and impact of previous corrective actions are discussed.
2	Students will design and conduct experiments and analyze and interpret data.	Modern Physics Lab, Optics Lab, Analog and Digital Electronics, Nanoscience Frontiers, Experimental Physics	Student performance on specific assignments in listed courses assessed by course instructor according to outcome-specific rubric listed below.	In annual department meetings assessment results at individual level and in aggregate, corrective action for weaknesses in student attainment, and impact of previous corrective actions are discussed.
3	Students will collaborate effectively on teams.	Group projects in Modern Physics Lab, Analog and Digital Electronics, Optics Lab	Student performance on specific assignments in listed courses assessed by course instructor according outcome-	In annual department meetings assessment results at individual level and in aggregate, corrective action for

			specific rubric listed below.	weaknesses in student attainment, and impact of previous corrective actions are discussed.
4	Students will communicate effectively and professionally in oral and written formats	Research presentation; written and oral presentations are assigned in Modern Physics I&II, Optics Lab, Nanoscience Frontiers, Applications of Quantum Mechanics	Student performance on specific assignments in listed courses assessed by course instructor according to outcome-specific rubric listed below.	In annual department meetings assessment results at individual level and in aggregate, corrective action for weaknesses in student attainment, and impact of previous corrective actions are discussed.
5	Students will be able to discuss contemporary issues in science and technology	Student presentations in Modern Physics I, Modern Physics II, and Applications of Quantum Mechanics	Student performance on specific assignments in listed courses assessed by course instructor according to outcome-specific rubric listed below.	In annual department meetings assessment results at individual level and in aggregate, corrective action for weaknesses in student attainment, and impact of previous corrective actions are discussed.
6	Students will be able to formulate numerically and solve scientific problems utilizing at least one programing language or environment	Assignments in Analog and Digital Electronics, Modern Physics Lab, Classical Mechanics, Quantum Mechanics, and Optics Lab; research; computer science course	Student performance on specific assignments in listed courses assessed by course instructor according to outcome-specific rubric listed below.	In annual department meetings assessment results at individual level and in aggregate, corrective action for weaknesses in student attainment, and impact of previous corrective actions are discussed.

Additional Questions

1. On what schedule/cycle will faculty assess each of the above-noted program learning outcomes? *(It is not recommended to try to assess every outcome every year.)*

Academic Year	Student Outcomes Assessed
2017/18	**5, 6**
2018/19	**2, 3**
2019/20	**1,4**

Three year rotation

2. Describe how, and the extent to which, program faculty contributed to the development of this plan.

The program faculty collectively developed the outcome-specific rubrics.

3. On what schedule/cycle will faculty review and, if needed, modify this assessment plan?

Faculty will annually review and, if needed, modify the assessment plan.

IMPORTANT: Please remember to submit any assessment rubrics (as noted above) along with this report.

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	Works productively in

			various aspects of group work.	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 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.

Example Assignments for Outcomes Assessment

Outcome 1: Calculate the motion of a loaded string when an impulsive force is applied to one of the masses. Find wave function, transmission and reflection coefficients for given potential. Find the lifetime of the Hydrogen atom in the first excited state, enumerating all transitions between n=2 and n=1. Find the maximum work and voltage output of a fuel cell or battery. Use the laws of ray optics to design and test in the laboratory a multi-lens optical system and use the laws of wave optics (such as diffraction) to predict the resolution limits of this optical system.

Outcome 2: Design and conduct an experiment to calibrate an optical microscope. Design and test a nanoprobe for patterning of nanomaterials.
Design a circuit that can drive a stepper meter using transistors. Design a low voltage probe and demonstrate magnetic memory read and write.

Outcome 3: Design, machine, and test a nanoprobe. Design and machine a three-dimensional microwave cavity. This assignment is carried out by teams of students.

Outcome 4: Write a paper and give an oral presentation on a topic of current interest in physics or technology.

Outcome 5: Write a paper and give an oral presentation on a topic of current interest in physics or technology.

Outcome 6: Utilize a programming language or environment to numerically solve for the energy levels and wave functions of a particle in a finite square potential well. Use programmable Arduino cards for data acquisition and analysis in high precision measurements. Program modern electronics embedded systems using LabView to automate experiments.