Physics B.S. Assessment Plan

Designation	Title	1.1 Information Literacy	1.2 Problem Solving	1.3 Inquiry and Analysis	1.4 Critical and Creative Thinking	1.5 Instrumentation and software	2.1 Laws of Physics	2.2 Multidisciplinary problem solving	3.1 Communicate in writing.	3.2 Communicate in multiple ways	4.1 Teamwork	4.2 Plan, organize, and prioritize
PHYS 211	University Physics I	1	2		2		3	2		1		1
PHYS 213	University Physics II	1	2	1	2		3	2		1		1
PHYS 213L	University Physics Lab.	1	2	2	2		3	2	2	2	2	
PHYS 225	Vibrations, Waves, Optics	1	1				3	1		1		1
PHYS 275	(Special) Relativity	1	1				3	1		1		1
PHYS 312	Exp. Physics Design I	3	3	3	3	3	1	3	3	3	3	3
PHYS 314	Exp. Physics Design II	3	3	3	3	3	1	3	3	3	3	3
PHYS 331	Intro. to Modern Physics	1	1				3	1		1		1
PHYS 341	Thermodynamics	1	1				3	1		1		1
PHYS 343	Statistical Physics	1	1				3	1		1		1
PHYS 350	Advanced Physics Lab.	2	2	2		3	2	3		3	3	3
PHYS 361	Optics	1	1				3	1	3	1		1
PHYS 412	Adv. Design Projects I	3	3	3	3	3	1	3	3	3	3	3
PHYS 414	Adv. Design Projects II	3	3	3	3	3	1	3	3	3	3	3
PHYS 421	Electromagnetism	1	1				3	1		1		1
PHYS 433	Nuclear & Particle Physics	1	1				3	1		1		1
PHYS 439	Solid State Physics	1	1				3	1		1		1
PHYS 451	Classical Mechanics	1	1				3	1		1		1
PHYS 471	Quantum Mechanics	1	1				3	1		1		1
PHYS 481	Mathematical Physics	1	2		2	2		2		2		1

3	High Importance
2	Medium Importance
1	Low Importance
	No Importance

The Table above shows the mapping of the learning outcomes to the curriculum. Assessment of introductory courses for problem solving using the laws of physics is performed primarily using

the nationally normed and validated measures of the Force Concept Inventory (for PHYS 211) and the Conceptual Survey for Electricity and Magnetism (for PHYS 213). Additional assessment for the introductory courses may be achieved with rubrics based on data from homework assignments, quizzes, and exams. For the upper division physics courses, mastery of concepts and problem solving skills are assessed using rubrics that evaluate homework assignments, quizzes, and exams. Formative assessment is also achieved using open-ended questions and in-class discussions, analogy prompts, misconception checks, feedback based on hand signals, "think-pair-share" questions (peer instruction), and response cards. In the design courses (PHYS 312, 314, 412, 414) and the Advanced Physics Lab (PHYS 350), sets of rubrics will be used to assess the other high-importance learning outcomes. Exit interviews of graduating seniors, tracking of Physics GRE scores, and alumni surveys will provide additional assessment. In all lecture or laboratory courses, student opinion surveys (IDEA) will be employed to assist faculty in continuous improvement of the curriculum.

PHYSICS B.S. OBJECTIVES & OUTCOMES

OBJECTIVE 1: Students will have strong scientific and technical skills.

Outcomes

1. Students will have information literacy (cross-cutting outcome).
   The ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively and responsibly use and convey that information to address the need or problem at hand.
2. Students will be skilled at problem solving (cross-cutting outcome).
   The process of designing, evaluating and implementing a strategy to answer an open-ended question or achieve a desired goal.
3. Students will skilled at inquiry and analysis (cross-cutting outcome).
   A systematic process of exploring issues, objects or works through the collection and analysis of evidence that results in informed conclusions or judgments. Analysis is the process of breaking complex topics or issues into parts to gain a better understanding of them.
4. Students will be skilled at critical and creative thinking (cross-cutting outcome).
   A habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion. Both the capacity to combine or synthesize existing ideas, images, or expertise in original ways and the experience of thinking, reacting, and working in an imaginative way characterized by a high degree of innovation, divergent thinking, and risk taking.
5. Students will demonstrate skills with instrumentation, software, coding, and data analysis.

OBJECTIVE 2: Students will effectively use physics to solve problems.

Outcomes

1. Students will demonstrate competency in applying basic laws of physics in classical and quantum mechanics, electricity and magnetism, thermodynamics and statistical mechanics

and special relativity, and the applications of these laws in areas such as optics, condensed matter physics, properties of materials, nuclear and particle physics, and other disciplines.
2. Students will be able to solve problems that span several physics areas or are multidisciplinary.

OBJECTIVE 3: Students will communicate effectively.

Outcomes

1. Students will communicate in writing about scientific and technical concepts concisely and completely.
2. Students will organize and communicate ideas using words, mathematical equations, tables, graphs, pictures, animations, diagrams, and other visualization tools.

OBJECTIVE 4: Students will have strong professional/workplace skills.

Outcomes

1. Students will have the ability work well in teams ("Teamwork" cross-cutting outcome).
   Behaviors under the control of individual team members - effort they put into team tasks, their manner of interacting with others on team, and the quantity and quality of contributions they make to team discussions.
2. Students will be able to plan, organize, and prioritize work.