Program Learning Outcomes (Graduate Program):

1. The student will demonstrate proficiency in the basic and applied fields of physics.
2. The student will apply physical principles to novel situations, both in the classroom and in research settings.
3. The student will develop good experimental technique, including proper setup and care of equipment, conducting experiments and analyzing results in order to observe physical phenomena, assess experimental uncertainty, and make meaningful comparisons between experiment and theory.
4. The student will develop effective written and oral communication skills, especially the ability to transmit complex technical information in a clear and concise manner.
5. The student will appreciate the importance and practice of ethics in science.

Methods of Assessment:

A. Embedded questions
B. Independent Study or Research
C. Seminar
D. Exit Interview
E. Qualifying Exams
F. Thesis Research
G. Thesis Writing/Defense

Learning Objective -Assessment Method Matrix

Objective	Method	When	Who
1	A	Periodically through each course	Course Instructor
	E	Written and Oral Exams	Thesis committee
2	C	Classroom Presentations	Course Instructor
	B	Final report for 575/576	Course Instructor
	F	Thesis research	Thesis committee
3	B	Periodically throughout course	Course Instructor
	F	Thesis research	Thesis committee
4	C	Seminars Delivered	Faculty in attendance
	E	Written and Oral Exams	Thesis committee
	G	Theoretical development/Data reduction	Thesis committee
5	D	Final Semester	Department Chair
	F	Research for larger groups	Thesis Chair

Assessment Method-Learning Objective Matrix

Method	Objective	When	Who
A	1	Periodically through each course	Course Instructor
B	2	Final report for 575/576	Course Instructor
	3	Periodically throughout course	Course Instructor
C	4	Seminars delivered	Faculty in attendance
	2	Classroom Presentations	Course Instructor
D	5	Final semester	Department Chair
E	1	Written and Oral Exams	Thesis committee
	4	Written and Oral Exams	Thesis committee
F	2	Thesis research	Thesis committee
	3	Thesis research	Thesis committee
	5	Research for larger groups	Thesis committee
G	4	Theoretical development/Data reduction	Thesis committee

PHY 511 – Nuclear Physics

By the end of the course, a successful student will be able to:

Student Learning Outcomes	Objective
Identify properties of the nucleus and other sub-atomic particles	1,2
Sketch the theory and the experimental observations related to subatomic particles	1,4
Apply classical, relativistic, and quantum physics to examine and understand the processes and machines which produce and detect subatomic particles	1,2

PHY 512 – Atomic Structure

By the end of the course, a successful student will be able to:

Student Learning Outcomes	Objective
Develop the statistical distribution laws from first principles	1
Associate observed spectra to atomic theory	1
Develop semi-classical models of the atom and show how these models lead to quantum mechanics	1
Identify the four quantum numbers both from a comparison to the classic two-body problem and from the vector model of the atom	1

PHY 531 – Classical Mechanics

By the end of the course, a successful student will be able to:

Student Learning Outcomes	Objective
Derive Lagrange's equations from D'Alembert's and Hamilton's principles and apply these equations to holonomic and nonholonomic systems, including the two-body central force problem.	1

PHY 532 – Electromagnetic Waves

By the end of the course, a successful student will be able to:

Student Learning Outcomes	Objective
Describe electromagnetic behavior of conductors, insulators, capacitors, charge distributions and their associated electric field.	1, 2
Examine electrostatics, electrostatic energy, and the electrostatic field in dielectric media.	1, 2
Construct the electric potential for a wide variety of cases.	1, 2
Describe the magnetic properties of matter, magnetostatics, and electromagnetic induction.	1, 2
Manipulate Ohm's law, Ampere's Law, and Maxwell's equations.	1, 2
Solve Poisson's equation and Laplace's equation	1, 2

PHY 534 – Solid State Physics

By the end of the course, a successful student will be able to:

Student Learning Outcomes	Objective
Associate the physical applications of quantum physics to the study of the solid state.	1,2,4
Examine the behavior of solid state systems and, through the application of physical laws, and make quantitative predictions of future behavior based upon the boundary conditions which exist	1,2
Develop the facility for problems associated with the solid state with respect to semi-conductor physics	1,2,4

PHY 551 – Advanced Quantum Mechanics

By the end of the course, a successful student will be able to:

Student Learning Outcomes	Objective
Demonstrate a working, quantitative understanding of the quantum phenomena and processes.	1, 4
Apply the concepts of quantum mechanics to quantitatively predict behavior of physical systems.	1, 4