

## **Physics Graduate Core Courses: Title and Description**

### **PHYS 2010 Techniques in Experimental Physics**

In the course of this semester you will perform six experiments which – when they were carried out for the first time, during the 20th century – led to important discoveries and shaped our understanding of modern physics. For many of the experiments, you would have won a Nobel Prize if you had been the first to do them.

This laboratory course will give you hands-on experience with experimental techniques. In carrying out the experiments, you will encounter both random and systematic effects in your data. These effects are present in any experiment. Learning to identify, control and minimize these effects is an essential part of carrying out successful experiments.

### **PHYS 2030 Classical Theoretical Physics I**

Basic Newtonian physics including scattering problems and accelerated coordinate systems. Lagrangian and Hamiltonian dynamics. Small oscillations. Green's functions. Introduction to elasticity theory and fluid mechanics.

### **PHYS 2040 Classical Theoretical Physics II**

Some topics covered: Electrostatics, Magnetostatics, Maxwell's equations of electromagnetism, Plane EM waves and wave propagation, Radiation by localized oscillating source, Radiation by moving charges.

### **PHYS 2050 Quantum Mechanics**

Topics covered: Mathematical Background: Finite and Infinite Dimension Linear Vector Spaces, Bra-Ket Vectors and Operators; Fundamental postulates of quantum mechanics. Schrödinger equation in 1D: Reflection at a step, Reflection at a barrier and tunneling, harmonic oscillator, coherent states; Theory of angular momentum; Hydrogen atom, Spin  $\frac{1}{2}$  and two level systems.

### **PHYS 2060 Quantum Mechanics**

Topics covered: Review of angular momentum and spin, Addition of angular momenta and tensor operators, Variational methods, Perturbation theory: time-independent and time dependent; Scattering theory; second quantization

### **PHYS 2140 Statistical Mechanics**

The goal of PHYS 2140 is to gain an understanding of the role of classical and quantum statistical mechanics in the physics of systems in equilibrium with the environment and to develop the ability to solve a class of important problems in physics.