

# **A Modern Physics Laboratory**

**created by**

## **Department of Scientific Research & Development**

Department of Scientific Research & Development at Polytechnic University of Puerto Rico has over the past almost 3 years worked to develop and implement a Modern Physics Laboratory to:

- Perform demonstrations of scientific theories
- Do hands-on exercises
- Introduce students to research

This Modern Physics Laboratory is a great opportunity for our students to:

- Be exposed to the Research Environment
- Experience the thrill of science
- Prepare to participate in future research activities

The Modern Physics Laboratory will be split in 4 different laboratories

### **Basic Modern Physics Laboratory**

Advanced Physical Science and electronic devices engineering with a definite modern approach is the focus of this laboratory Environmental Research. The Basic Modern Physics Laboratory offers the opportunity to study the Special Relativity Theory, Maxwell's equations and electromagnetic waves, Physical Optics, principal applications, particle physics, atomic structure and molecules, Quantum mechanics engineering and application to solid state semiconductors devices to name a few. Specific experiments that can be performed include: Measurement of the electron charge, electron mass, speed of light, the Plank constant, the Boltzman constant and other important atomic physics parameters.

### **Laser Laboratory**

The students will study the principles of laser electronics, covering the basic information of laser physics and the physical processes important in scientific research, communications, industry and medicine. Furthermore, a comprehensive study of the atomic structure, the light emission, the laser production with laser applications experiments. Students will acquire the basic knowledge required to study more specialized areas of electrical engineering especially the areas of communications, computers and electronics. Currently, we have an Ion Argon Laser and a Dye Laser of high power for engineering applications available in the Laser Laboratory and with that equipment the students can perform more than 30 different experiments.

### **Plasma Laboratory**

In this laboratory the students will study the principles of plasma engineering, covering the basic information on plasma physics and the physical processes that are important in industrial plasmas, sources of ion and electron beams and ionizing radiation used in industrial applications. In this Plasma Laboratory it is possible to create plasmas with a very wide range of plasma densities and plasma temperatures, and consequently many different plasma applications can be performed in this Laboratory. Students will acquire basic knowledge required to study more specialized areas of electrical engineering, especially the areas of potential, computer and electronics. As this Laboratory is the only plasma laboratory in all of Puerto Rico, and one of only 19 in all of the US it offers the students of PUPR a unique opportunity to study in this highly specialized field. The main device of this Plasma Laboratory is a Mirror/Cusp Plasma Machine of 3 meters of length with 40,000 Gauss of Magnetic field and a high Microwave Power of 2.45 GHz with variable power from 50 watt to 5000 watt.

### **Radiological Sciences Laboratory** (to be implemented in the 2<sup>nd</sup> half of 2004)

Very shortly, we will begin setting up this Laboratory which will enable us to both perform radiation detection experiments as well as reading and controlling doses taken from both personnel and any given environment. Today, there is no facility in Puerto Rico similar to the Radiological Sciences Laboratory so all readings and controls have to be sent to the US to be performed there. Obviously, time is a crucial factor in case of an emergency so consequently with this Laboratory Puerto Rico's security will be greatly improved.