Puerto Rico Photonics Institute
UNIVERSIDAD METROPOLITANA

LABORATORY CONTENT

CERTIFICATE IN PHOTONICS & LASERS TECHNICAL SPECIALIST

OPSC 103 – LASERS AND APPLICATIONS II

This second Laser Systems and Applications course will introduce the student to the theory and practice of four of the most common types of lasers (diode, Argon-Ion, Nd:YAG and CO_2), and to the topic of integration of laser systems. At the end of the course, the student will understand the principles of laser operation, safety guidelines, measurement of output beam characteristics, and applications. This will allow the student to understand and operate lasers in research, commercial, and industrial settings, and will give him or her the skills to choose appropriate laser systems and the knowledge to setup, operate, and understand their value as part of more complex integrated systems.

Diode Lasers and Their Applications

In this module, students learn the theory behind diode laser operation, and they put that knowledge to practice in the laboratory, measuring the characteristics of a diode laser under different operating conditions. Lab work begins with a laser safety evaluation and making sure the work area is properly controlled and appropriate eyewear is available and in use. Students then measure power, the gain curve, beam profile, spectral output, and divergence & collimation.

In OPSC102 Students use a Thorlabs Model HL6320G diode laser with a LTC100-B controller.

Fiber Lasers and Their Application

Fiber lasers are diverse and powerful tools, and in this short module students get a taste for the basics. They learn about pumping, amplification, feedback systems (like distributed Bragg gratings), doping and other aspects of fiber lasers. In the laboratory, they do similar measurements to those with the other laser systems, but with the fiber there is a particular emphasis on safety, as the laser they use is not visible, but it is very powerful with high beam quality.

The students work with a VGEN-C laser from Newport Spectra-Physics.

CO_2 Laser

Fiber Laser

Argon - Ion Laser

Argon-Ion Lasers and Their Applications

Argon-ion lasers challenge students in many ways. Their complex energy level structure, high power requirements, and substantial power output over a number of lines require preparation for both safety and technical operation. Students compute eye safety requirements and the nominal hazard zone to properly contain the laser and protect operators. Once safety concerns are resolved, the students measure the power, beam profile, divergence, and laser spectrum for single and multi-line operation of a model Stellar Pro Select 150CE laser.

CO_2 Lasers and Their Application

CO_2 lasers are in the mid-IR and generally quite powerful. In this module, students learn about the gain process and scalability of CO_2 lasers. They learn that not all excitation process involve electron energy levels; that light can be emitted by jumps between vibrational states. In the laboratory, they work with a Coherent model E-150 laser, which can produce up to 200 W of power, by far the most powerful in PRPI's laboratory. They use burn paper to measure the beam profile, and they measure power.

This program is offered at the UMET Cupey campus, with laboratories at the PRPI labs in Barceloneta
Project New Horizons: Puerto Rico Lasers and Photonics Career Pathways
http://umet.suagm.edu/prpi | http://umet.suagm.edu/new_horizons

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