



NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF SCIENCES
PHYSICS PROGRAM

CF421 – LABORATORY OF INTERMEDIATE PHYSICS

I. GENERAL INFORMATION

CODE	: CF421 Laboratory of Intermediate Physics
SEMESTER	: 7
CREDITS	: 4
HOURS PER WEEK	: 8 (Theory – Laboratory)
PREREQUISITES	: EM560 Mechanical Workshop, IF242 Introduction to Metrology, IF282 Technical Drawing, CF382 Analog Circuits Electronics
CONDITION	: Compulsory

II. COURSE DESCRIPTION

The course prepares students for carrying out experiments properly using instruments and equipment common in a Physics laboratory. Students use optical instruments (laser, interferometer, spectroscopy), electronic instruments (oscilloscope, data acquisition, sensors, computers), vacuum, nuclear, among other instruments. Students complete classical experiments in Physics such as Franck-Hertz, Hall effect, measurement of natural constants such as speed of light, electron mass/charge ratio, Planck constant, etc., as well as determine the properties of diverse type of materials such as semiconductors, metals, polymers, etc.

III. COURSE OUTCOMES

1. Properly use measurement and visualization instruments and equipment, correctly setting and connecting them.
2. Measure variable with precision and verify the coherence of obtained values.
3. Orderly tabulate variables and draw them for establishing dependence relationships.
4. Use software tools for data processing and monitoring.
5. Correctly interpret obtained results, make generalization and formulate coherent conclusions.
6. Compare theoretical and experimental results verifying Physics laws, principles and theorems.

IV. LABORATORY EXPERIENCES

1. Electron mass/charge relation
2. Photo-electric effect
3. Electric conductivity of semiconductors
4. Frank-Hertz experiment

5. Ferromagnetism
6. Photometry
7. Microwaves
8. Light polarization
9. Nuclear measurements
10. Ultrasonic waves
11. Foucault pendulum
12. Thermal conductivity of metal bars

VI. METHODOLOGY

The course takes place in theory and laboratory sessions with the most of time spent by students carrying out laboratory experiments. At the beginning of each experiment, faculty presents the theoretical fundamentals and explains the method and details of the experiment to be done. Afterwards, students complete the experiment working in groups obtaining and analyzing data and results. For every experience, students present a report summarizing main results, analysis and conclusions. Student active participation is promoted.

VII. GRADING SYSTEM

The Final Grade (FG) is calculated with the following formula:

$$\mathbf{FG = (OT + PP) / 2}$$

OT: Average of 10 oral tests

PP: Average of laboratory reports

VIII. BIBLIOGRAPHY

1. **P.R. Bevington and D.K. Robinson**
Data Reduction and Error Analysis for the Physical Sciences
Mc Graw-Hill Interamerican, 2005
2. **A. Melissinos**
Experiments in Modern Physics
Academic Press Editions, New York, 2008