

UNIVERSITY OF PUERTO RICO
RIO PIEDRAS CAMPUS
COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF PHYSICS
UNDERGRADUATE PROGRAM

Title: X Ray crystallography

Code: PHYS 4055

Number of Credits: 3

Prerequisites: PHYS 3025

Description

Production, absorption and scattering of X rays. X-Ray spectrum and crystal diffraction. The reciprocal lattice. Diffraction by real crystals and liquids. Applications to solid state physics, biophysics, and metallurgy. The course is divided between lectures and experimental sessions.

Objectives

After completing this course the student will be able to understand the nature of the X-Ray radiation and its behavior when interacting with matter. The student will deal with applications of the X-Ray diffraction to determine crystal structure and biological material ordering.

Course Content

Topic	Assigned time (hours)
1. Production of X-Rays and the spectrum.	3
2. Production of X-Rays and the spectrum.	3
3. Crystal structure.	3
4. Lattices.	3
5. The X-Ray diffractometer.	3
6. Operation and safety rules.	3
7. X-Ray spectra of real crystals.	3
8. Determination of real X-ray patterns.	3
9. The reciprocal lattice and the interpretation of the patterns.	3
10. The reciprocal lattice and the interpretation of the patterns.	3
11. X-ray diffraction from DNA crystals and microstructures.	3
12. X-ray diffraction from DNA crystals and microstructures.	3
13. X-Ray patterns from metals and alloys.	3

14. X-Ray patterns from metals and alloys.	3
15. Electron diffraction: differences and similarities.	3
Total hours	45 contact hours

Instructional Strategy

The main instructional tools in this class are lectures and experiments using the X-ray diffractometer. Published X-ray patterns will be also used to be analyzed by the students.

Weekly homework assignments allow the student to practice the techniques discussed in class and in the lab to develop a deeper understanding of the material. Solutions of homework problems are subsequently discussed in class, where a student usually presents his/her solution.

Minimum Require Facilities

Traditional lecture room and X-ray diffractometer laboratory facilities.

Student Evaluation

50% laboratory work, 50% homeworks. The overall score is determined by calculating the percentage of points obtained by the student. Grades are then assigned according to the standard curve: 100-90% = A, 89-80% = B, 79-70% = C, 69-60% = D, 59-0% = F.

Grading System

Standard A to F Grading System.

Bibliography

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