

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

Title: Modern Optics

Code: PHYS 4056

Number of Credits: 3

Prerequisites: PHYS 3061

Description

Wave theory and applications. Interference and diffraction phenomena. Optics of solids. Lasers. Holography. Non-linear optics and other topics of modern optics. Application of this principles to the development and understanding of modern optical devices.

Objectives

After completing this course the student will be able to understand the nature of the optical phenomena, the optical response and properties of solids. The student will understand the fundamentals of the laser technology and physics and optical instruments as lenses, microscopes, diffractometers, filters, and waveguides.

Course Content

Topic	Assigned time (hours)
1. The light and its spectrum.	3
2. The physics of the electromagnetic waves.	3
3. Diffraction.	3
4. Interference.	3
5. The dielectric constant.	3
6. Reflection, refraction and transmission of electromagnetic waves in solids.	3
7. Absorption of EM waves by solids.	3
8. Absorption of EM waves by solids.	3
9. The physics of the laser	3
10. The physics of the laser	3
11. Non-linear optics	3
12. Non-linear optics	3
13. Applications: holography.	3
14. Applications: filters, diffractometers.	3
15. Other modern instruments and optical devices.	3

Total hours	45 contact hours
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Instructional Strategy

The main instructional tools in this class are lectures. Specific applications and equipment will be brought to the class. Weekly homework assignments allow the student to practice the techniques discussed in class 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 Required Facilities

Traditional lecture room and overhead projector.

Student Evaluation

60% 3 exams, 40% 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

Benton, S. A. and Bove, V. M. Jr. 2008. Holographic Imaging. Wiley Interscience.
Bigio, D. 2008. Laser Physics with Modern Optics and Nonlinear Optics. Wiley Interscience.
Kenyon, I. 2008. The Light Fantastic: A Modern Introduction to Classical and Quantum Optics. Oxford University Press.

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