

Degree	Type	Year
Physics	OB	3

## Contact

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## Teachers

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## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

It is recommended to be studying or to have studied the subject of OPTICS.

## Objectives and Contextualisation

1. Apply the fundamental laws and theoretical principles acquired by the student in the Optics course.
2. Familiarize the student with an experimental subject: importance of instrumentation in the design of experiments, use of measuring devices, data acquisition, data analysis, etc.
3. Know how to analyse the influence and importance of the various variables and their dependence on the phenomenon studied and/or analysed.
4. To awaken in the student a critical mentality with respect to the level of confidence of his measurements, calculations and the interpretation of the results.
5. Motivate the student in the bibliographic search to interpret the experimental results and / or delve into other approaches on a particular experiment.
6. Encourage experimental work and scientific discussion in groups.

## Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, and before both specialist and general publics
- Develop strategies for analysis, synthesis and communication that allow the concepts of physics to be transmitted in educational and dissemination-based contexts
- Formulate and address physical problems identifying the most relevant principles and using approximations, if necessary, to reach a solution that must be presented, specifying assumptions and approximations
- Plan and perform, using appropriate methods, study, research or experimental measure and interpret and present the results.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Use computer tools (programming languages and software) suitable for the study of physical problems
- Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
- Work independently, have personal initiative and self-organisational skills in achieving results, in planning and in executing a project
- Working in groups, assume shared responsibilities and interact professionally and constructively with others, showing absolute respect for their rights.

## Learning Outcomes

1. Analyse and assess the adequacy of the assemblies prepared and carried out, in order to obtain measurements and the desired results.
2. Analyse the influence of various parameters on the simulation of an experiment.
3. Communicate complex information in an effective, clear and concise manner, either orally, in writing or through ICTs, in front of both specialist and general publics.
4. Correctly assess the uncertainty associated with a measure or set of measures.
5. Describe physical phenomena, identify variables, analyse the influence, presenting the results and conclusions of the work developed in a clear and precise manner.
6. Describe the function and manner of operation of the measuring instruments used.
7. Determine and measure the variables that describe a physical system.
8. Discriminate to the most important dependencies and draw the most conclusions from a set of experimental measurements.
9. Explain the explicit or implicit code of practice of one's own area of knowledge.
10. Foster discussion and critical thinking, evaluating the precision and characteristics of the results obtained.
11. Identify the social, economic and environmental implications of academic and professional activities within one's own area of knowledge.
12. Suitably present the results of a series of measures through graphs and perform linear regressions.
13. Use basic programmes to write reports and carry out basic data processing.
14. Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
15. Use digital sensors for measuring magnitudes.
16. Work independently, take initiative itself, be able to organize to achieve results and to plan and execute a project.
17. Working in groups, assume shared responsibilities and interact professionally and constructively with others, showing absolute respect for their rights.
18. Write and present the results and conclusions of experimental work with rigor and conciseness.

## Content

The course, which is predominantly practical, consists of a theoretical part and a practical part.

The theoretical part delves into some important aspects of diffraction, interference, instrumentation, optical systems, precision, etc., which are later seen in the practical sessions.

The 10 practical sessions to be carried out are:

- 1.- Deflection of a laser beam by a material with a non-uniform refractive index. Application to the measurement of the relative concentration of two liquids in contact.
  - 2.- Measurement of the refractive index of a planar-parallel sheet with the microscope and the Pfund method.
  - 3.- Geometric optics. Images, the telescope as an optical system.
  - 4.- Optical spectra. Determination of wavelengths with a prism spectroscope.
- Polarization of light and study of anisotropic and photoelastic media. Verification of Malus' law.
- 6.- Interferences by amplitude division. The Michelson interferometer.
  - 7.- Interferences by division of the wave front. Fresnel Biprism. Qualitative study with a white light source. Determination of the wavelength of a monochromatic light.
  - 8.- Fresnel diffraction and Fraunhofer diffraction.
- Spectroscopy with a diffraction network. Calibration of the network with a lamp of known wavelengths. Determination of the Rydberg constant from the hydrogen Balmer series.
- 10.- Photoelectric effect. Determination of the Planck constant.

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory Practices	30	1.2	1, 2, 4, 6, 7, 8, 10, 16, 17, 15
theory lectures	10	0.4	4, 6, 5, 12, 15
Type: Autonomous			
Preparation and report writing	84	3.36	1, 2, 4, 6, 5, 8, 10, 12, 18, 16, 17, 13

### Theoretical Classes:

During the first 3 weeks of the course, 10 hours of theoretical classes will be given as an introduction to the Optics laboratory, where some of the theoretical content of the subject will be developed.

### Laboratory Practices:

Students, in groups of 2, will carry out a total of 8 laboratory sessions. The subject will include two types of sessions:

- 6 experimental sessions (sessions 1, 2, 3 and sessions 5, 6, 7): In each of these sessions, a practice will be carried out.
- 2 evaluative sessions (session 4 and session 8): These sessions will include oral questions by groups.

Students will have the practice scripts available in advance for their preparation, through the Virtual Campus.

It is necessary to complete all the sessions in order to pass the course. At the beginning of the course, the dates for the experimental practices will be assigned. Changing practice days is not allowed, except in cases of force majeure and with proper justification.

At the end of each of the 6 experimental sessions, each group must upload to the Virtual Campus the experimental measurements and work carried out in the session, results, conclusions, as well as answer all the questions posed in the laboratory script.

#### Submission of Personal Report:

Each student must submit a personal report on one of the practices carried out. The personal report, in scientific article format, must consist of the following parts: introduction and objectives, results and discussion, conclusions, bibliography, and answers to the questions posed.

All results obtained in the laboratory must be correctly presented in tables with the corresponding uncertainties and units. Graphs must be presented with a title, magnitudes, units, and uncertainty bars. If necessary, the corresponding adjustment of the results will be made.

#### Tutorials:

Throughout the course, discussion between each of the student groups and the teaching staff will be encouraged. The teaching staff of the subject will be available to resolve doubts in tutorial sessions. At the beginning of the course, the contact methods with the teaching staff will be provided to define these possible tutorials.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
group collective reports	30%	0	0	1, 2, 4, 3, 6, 5, 7, 8, 9, 10, 11, 12, 14, 18, 17, 13, 15
Oral or written defense	40 %	1	0.04	1, 2, 4, 3, 6, 5, 7, 8, 10, 14, 16, 17, 15
personal report	30 %	0	0	1, 2, 4, 3, 6, 5, 7, 8, 9, 10, 11, 12, 14, 18, 16, 13, 15

BLOCK	WEIGHT	Description
Personal work	30%	Evaluation of the individual report based on the chosen practice.

Group work	30%	Evaluation of the work carried out during the experimental sessions through oral tests in the laboratory, in sessions 4 and 8 during laboratory hours.
Oral or written defense	40%	Evaluation of an oral presentation on a new practice or a written exam on the practices carried out.

It is mandatory to carry out all the practices, in order to have the right to take the oral or written defense.

A minimum score of 3 in each block (personal work, group work and oral or written defense) must be obtained in order to be able to make an average.

Given the eminently practical character of the subject the possibility of recovery is NOT CONTEMPERATED.

All those students who have completed two evaluation activities cannot be qualified as "Not assessable".

## Bibliography

Theory books:

- K.D. Möller. *Optics*. University Science Books, 1988
- E. Hecht. *Optics*. Addison-Wesley, 2017
- F.A. Jenkins, H.E. White. *Fundamentals of Optics*. McGraw-Hill, 1981
- J. Casas. *Óptica*. L. Pons. 1994
- M.L. Calvo (ed). *Óptica avanzada*. Editorial Ariel. 2002

Laboratory practice books:

- M.D. Baró, G. Orriols, F. Pi, R. Pintó i S. Suriñach. *Tècniques Experimentals en Física*. Col. Materials, 37. Servei de Publicacions de la UAB, Barcelona, 1997
- Other books on general topics recommended in previous teaching laboratories

Videography (YouTube list):

- <https://youtube.com/playlist?list=PLKIOJCSTg5dqVUJzTnS0oA1eVDjQqFkys>

## Software

Python, MATLAB, Excel, and any other data processing software.

## Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	1	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	2	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	3	Catalan	second semester	afternoon
(PLAB) Practical laboratories	4	Catalan	second semester	afternoon
(PLAB) Practical laboratories	5	Catalan	second semester	afternoon
(PLAB) Practical laboratories	6	Catalan	second semester	morning-mixed
(TE) Theory	1	Spanish	second semester	morning-mixed