COURSE DATA

Data Subject	
Code	34258
Name	Optics II
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1105 - Degree in Physics	Faculty of Physics	3	Second term

Subject-matter

Degree	Subject-matter	Character
1105 - Degree in Physics	12 - Optics	Obligatory

Coordination

Name	Department
FERRANDO COGOLLOS, ALBERT	280 - Optics and Optometry and Vision Sciences

SUMMARY

This is a theoretical course (no labs) with 6 ECTS allocated for the second quarter of Optics material and natural continuation of Optics I. Its primary objectives are the subject (the students acquire basic knowledge about the behavior of light which have been completing the course in Optics I. In particular, key aspects of the wave nature of light (interference and diffraction) are studied and again the light-matter (diffusion, nonlinear optics) interaction . To complete the subject turns to analyze the light-matter in order to explain the basic mechanisms of laser and other light sources optical interaction interest. Teaching is part of the third year of the degree in physics, along with the materials Electromagnetism and Quantum Physics, and obviously has a direct relationship with the Experimental Techniques Optical. Matter Optics is basic physics and as such, the knowledge that the optical behavior are useful in many other subjects, especially as Regarding the wave behavior. Moreover, this course continues in subjects Electromagnetic Optics and Quantum Optics fourth grade.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Previous knowledge acquired in the subject optical Optics I. Knowledge of general math (trigonometry, mathematical analysis, solving simple differential equations, vectors). Very basic knowledge of electromagnetism.

OUTCOMES

1105 - Degree in Physics

- Knowledge and understanding of the fundamentals of physics in theoretical and experimental aspects, and the mathematical background needed for its formulation.
- To know how to apply the knowledge acquired to professional activity, to know how to solve problems and develop and defend arguments, relying on this knowledge.
- Developing learning skills so as to undertake further studies with a high degree of autonomy.
- Problem solving: be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems .
- Communication Skills (written and oral): Being able to communicate information, ideas, problems and solutions through argumentation and reasoning which are characteristic of the scientific activity, using basic concepts and tools of physics.
- Destrezas Generales y Específicas de Lenguas extranjeras: Mejorar el dominio del inglés científico-técnico mediante la lectura y acceso a la bibliografía fundamental de la materia.
- Ser capaz de proseguir con el estudio de otras materias de la física gracias al bagaje adquirido en el contexto de esta materia.
- Comprensión teórica de conceptos físicos: Conocer y comprender los fundamentos del electromagnetismo y de las ondas, así como del bagaje matemático para su formulación y de los fenómenos físicos involucrados y de las aplicaciones más relevantes.
- Destrezas matemáticas: Comprender y dominar el uso de los métodos matemáticos y numéricos más comúnmente utilizados para la resolución de problemas en el contexto de esta materia.
- Modelización y resolución de problemas: Saber resolver problemas, siendo capaz de identificar los elementos esenciales de una situación y de realizar las aproximaciones requeridas con objeto de reducir los problemas a un nivel manejable. Más concretamente, ser capaz de obtener las diferentes soluciones para el campo electromagnético en los ámbitos contemplados por los contenidos de la materia y ser capaz de interpretar físicamente los resultados.

- Cultura General en Física: Haberse familiarizado con las áreas más importantes de la mecánica en relación con la Física en general, y con enfoques que abarcan y relacionan diferentes áreas de la Física.

LEARNING OUTCOMES

- Ability to refer to the basic principles of physical theories and experiments related to optics.

- Ability to build a implificado models describing the approach necessary in order to study and thus allows predictions about its future.

- Ability to use their mathematics in a way related to the real world.

- Ability to solve optical problems.

- Ability to learn the state of the art of discipline and its upgrade processes.

DESCRIPTION OF CONTENTS

1. Interference

1.1 The phenomenon of interference.
1.2 Conditions of interference.
1.3 Wavefront division interference: Young's experiment.
1.4 Amplitude division interference.

2. Diffraction

2.1 Preliminary considerations. Far field and near field diffraction .
2.2 Fresnel diffraction.
2.3 Fraunhofer diffraction.

3. The laser

3.1 Einstein's theory of light-matter interaction.
3.2 Stimulated emission. Population inversion.
3.3 The laser. Constituent elements.
3.4 The optical cavity.
3.5 The laser emission.

4. Introduction to nonlinear optics

4.1 The generalized Lorentz model.
4.2 Centrosymmetric media: Kerr effect and third harmonic generation.
4.3 No centrosymmetric media: second harmonic generation and frequency summation and substraction.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Tutorials	15,00	100
Study and independent work	45,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	30,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

Contact teaching 40%

Theoretical and practical classes: It addresses the conceptual and formal matter and resolution of problems or cases as the application of theoretical concepts. They are based mainly on lectures with dialogue and the use of teaching tools such as experimental demonstrations, animations or videos, graphic solutions, design presentations, etc.)..

Group tutoring sessions or work in small groups: focus on student work and their active participation: resolving doubts in dealing with theoretical concepts and problem solving, reinforcement in areas of greatest difficulty, questionnaires conceptual , experimental demonstrations relevant to the case studies and associated with a component of ongoing evaluation, monitoring of student progress in the field.

Student's personal work 60%

- Study of the theoretical.

- Troubleshooting (individually or in groups)

- Individual tutorials querying of the teacher on student concerns and difficulties encountered in the study and resolution of problems, or discussion on topics of interest, bibliography, etc.

EVALUATION

(please look at the addendum)

REFERENCES

Basic

- E. Hecht and A. Zajac. Óptica. Addison Wesley Iberoamericana (1990).
- P. W. Milonni and J. H. Eberly, Lasers. John Wiley & Sons (1988).
- R. D. Guenther. Modern Optics. John Wiley & Sons (1990).

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

In accordance with the new adjustments to the teaching of official UVEG degrees for the start of the second semester of the 2020-21 academic year, and which is included in the resolution of the Rector of the University of Valencia, of January 28, 20201 , https://links.uv.es/8kXO6vG we add this addendum to the teaching methodology in the Teaching Guides of the second semester subjects:

TEACHING METHODOLOGY:

During the month of February 2021, the teaching of theories and seminars-supervised works, go to synchronous videoconference modality given at the time set by the subject and the group. As of March 1, the teaching modality indicated in the Teaching Guide and in the teaching modalities approved in the Academic Degree Commissions of the months of July 2020 and 11 2020, respectively, will be followed, unless the health authorities and Rectorate indicate a new reduction in presence, in this case it would return to the synchronous videoconference mode.

EVALUATION

The evaluation of this subject will be carried out in two parts:
1) A written examination, including theory and problems, whose maximum grade is 4 points. The theory part will evaluate the understanding of the theoretical, conceptual aspects and the formalism of the subject, both through theoretical questions and through conceptual and numerical questions or simple particular cases. The problems part will evaluate the ability to apply the formalism to specific cases, as well as the critical analysis of the results obtained. In both parties, a correct argumentation and adequate justification of the results will be assessed.
2) Continuous evaluation, which will assess the work done by the student during the course in the resolution of questions and problems, and in the development of topics, both in the classroom and at an individual level or by means of any other method that supposes an interaction between teachers and

students. This activity will be valued at up to 6 points. The percentage (or weight) assigned to each of these activities, on the total grade, will be:

* Exam: Theory 20%. Problems 20%.
* Continuous evaluation: Theory 20%. Problems 20%. Numerical simulations 20%

In the first and second call the qualification will be:
max{N1,0.6*N2+0.4*N1}
Where N1 is the exam grade and N2 is the continuous evaluation grade.