COURSE DATA

Data Subject	
Code	34307
Name	Ophthalmic optics
Cycle	Grade
ECTS Credits	9.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1207 - Degree in Optics and Optometry	Faculty of Physics	2	Annual

Subject-matter

Degree	Subject-matter	Character
1207 - Degree in Optics and Optometry	14 - Ophthalmic optics	Obligatory

Coordination

Name	Department
PONS MORENO, ALVARO MAXIMO	280 - Optics and Optometry and Vision Sciences
SILVESTRE MORA, ENRIQUE	280 - Optics and Optometry and Vision Sciences

SUMMARY

The subject aims to study the principles of design and adaptation of ophthalmic lenses to compensate refractive ametropias, presbyopia and binocular vision anomalies. After studying the principles of Physiological Optics, the student can apply the concepts of theoretical eye and ametropia to define the different types of optical compensation for these problems by using ophthalmic lenses. The student should understand and know the different types of possibilities depending on its geometry and manufacturing characteristics, as well as the different commercial options that can be found on the market. It will also be important to know the different compensation options for presbyopia, as well as the methods for evaluating the visual quality obtained with these compensations.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

The student must have knowledge of Geometrical Optics and Physiological Optics

OUTCOMES

1207 - Degree in Optics and Optometry

- To have and to understand the fundamentals of Optometry for its correct clinical and healthcare application.
- Knowing how to apply the knowledge acquired to professional activity, knowing how to solve problems and develop and defend arguments.
- Being able to gather and interpret relevant data to make judgments.
- Being able to transmit information, ideas, problems and solutions to both a specialized and non-specialized audience.
- Development of learning skills necessary to undertake further studies with a high degree of autonomy.
- To know the applicable legislation in professional practice, with special attention to matters of gender equality between men and women, human rights, solidarity, sustainability, protection of the environment and promotion of the culture of peace.
- To know the principles, description and characteristics of the fundamental optical instruments, as well as the instruments used in optometric and ophthalmological practice.
- To know and to calculate the most relevant geometric, optical and physical parameters that characterize all types of ophthalmic lenses used in optometric prescriptions and to know how to relate them to the properties involved in the adaptation process.
- To know the physical and chemical properties of the materials used in optics and optometry.
- To know the processes of selection, manufacture and design of lenses.
- Being able to handle the techniques of centering, adaptation, assembly and manipulation of all types of lenses, an optometric prescription, visual aid and protective glasses.
- To know and to handle the techniques for the analysis, measurement, correction and control of the effects of compensating optical systems on the visual system, in order to optimize their design and adaptation.
- Training for the calculation of the geometric parameters of specific visual compensation systems: low vision, intraocular lenses, contact lenses and ophthalmic lenses.

- To identify and to analyze environmental and occupational risk factors that can cause visual problems.

LEARNING OUTCOMES

— Be able to handle the techniques of centering, adaptation, mounting and handling of all types of lenses, of optometric prescriptions, visual aid and safety glasses.

— Know and use techniques for analyzing, measuring, correcting and controlling the effects of compensating optics on the visual system, in order to optimize the design and adapt them.

— Training for the calculation of the geometric parameters of specific visual compensation systems: low vision, contact lenses and ophthalmic lenses.

— Identify and analyze environmental and occupational risk factors that can cause visual problems.

DESCRIPTION OF CONTENTS

1. Monofocal lenses

Lesson 1. Spherical lenses I: Basic concepts. Vertex power. Thickness. Measurement of vertex lens power. Spherical effect. Spherical ametropia compensation.
Lesson 2. Astigmatic lenses: Study of the astigmatic beam. Reduced power of principal and non principal meridians. Astigmatic lenses. Rules of transposition and regular forms. Astigmatic ametropia compensation.
Lesson 3. Spherical lenses II: Aberrations of spherical lenses. Oblique astigmatism. Curvature of field. Adaptation of monofocal lenses.
Lesson 4. Aspheric lenses: Aspheric optical surfaces. Properties of aspheric lenses. Power-to-weight ratio.

2. Prisms and multifocal lenses

Lesson 5. Prisms and prismatic effects Vision with a prism. Power units. Combinations of prisms. Prismatic effects in monofocal lenses. Prismatic effects produced by decentration. Prentice's rule. Astigmatic lenses. Use of prisms in the compensation of heterophoria and other ocular deviations. Prismatic imbalances in the assembly of monofocal lenses.
Lesson 6. Multifocal lenses I Introduction to the compensation of presbyopia. Compensation of

presbyopia, need for the introduction of multifocal lenses. Historical evolution of the multifocal lens. Bifocal lenses: types, characteristics and adaptation. Problems of adaptation. Position of the near vision optic center in bifocal lenses. Prismatic effects in bifocal lenses. Image shift. Aberrations in bifocal lenses. Problems of adaptation.
Lesson 7. Multifocal lenses II: Progressive lenses Evolution and development of the progressive lens. Theory of the progressive lens. Vision with a progressive lens. Assembly and adaptation. Problems of adaptation.
Lesson 8. Occupational lenses. Occupational visual ergonomics. Principles of occupational lens design. Applications of progressive lenses in occupational designs.
Lesson 9. Protection to radiation and impact.
Lesson 10. Manufacture of ophthalmic elements Introduction. General process. Manufacturing control. Manufacturing processes of spherical surfaces and toric surfaces. Manufacture of multifocal lenses. Optical coatings and other treatments.

3. Ophthalmic Optics Laboratory

Practice 1: Determination of geometric parameters in spherical lenses: radius of curvature, thickness and diameter of the lenses.
Practice 2: Astigmatic lenses: determination of the geometric and optical parameters of the astigmatic lenses.
Practice 3: high positive and negative power lenses. Determination of the refractive index of the lenses. Determination of aspheric surfaces.
Practice 4: Study and management of the lensmeter. Measurement of spherical lenses and glasses mounted with spherical lenses.
Practice 5: Measurement of astigmatic lenses not positioned with the lensmeter. Optical diagrams.
Practice 6: Measurement of astigmatic lenses positioned with the lensmeter. Optical diagrams.
Practice 7: Measurement of bifocal and multifocal lenses with the lensmeter.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Tutorials	30,00	100
Laboratory practices	15,00	100
Development of group work	10,00	0
Development of individual work	10,00	0
Study and independent work	75,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**225,00**	

TEACHING METHODOLOGY

This matter has a highly charged practice, dedicated to the main competition to be acquired at the end of this matter. This will take into account the following methodology:

Lectures:-campus classes (with possible modalities include blended or face) where taught the theoretical matter. They reinforce the use of audiovisual methods, which exemplify more clearly the theoretical and examples to develop.

Small Group Theory sessions: These sessions dedicated to student group work, with proposals of theoretical issues and actual cases to be analyzed and studied by the group. Interactivity will be sought through group presentations and classroom examples, made in continuous assessment.

Practical classes: on-campus classes that will develop the theoretical concepts into practical application in the lens adaptation workshop. These classes are held in small groups of maximum 16 students.

EVALUATION

The assessment of this subject is obtained from the weighted average of the grades obtained in the three Thematic Units.

At the end of the Thematic Units I and II a written examination will be carried out. The average of these two exams will represent 50% of the final grade. The seminary works or the exercises presented by the students in each of the terms will provide two grades that, averaged, will contribute to 30% of the final grade. The third Thematic Unit (Laboratory) will be evaluated through a laboratory test, assessing both the attendance to the practices and the work developed by the student during the course. This third unit contributes 20% to the final grade.

To pass the subject it is necessary to obtain a grade higher than 3.5 points (out of ten) in each of the written exams and in the Practice Unit. Globally it is necessary to obtain a score of at least five points out of a maximum of ten.

The second call will consist of the repetition of one or both written exams made at the end of the Thematic Units I and II, keeping the rest of the notes and their weights.

REFERENCES

Basic

- Referencia b1: Óptica Clínica. T. E. Fannin y T. Grosvenor. Ed. Omega (2007).
  Referencia b2: Tecnología Óptica. Lentes Oftálmicas, diseño y adaptación. J. Salvado y M. Fransoy. Ediciones UPC (1997).
  Referencia b3: Ophthalmic Lenses and dispensing. M. Jalie. Butterworth (2007).
  Referencia b4: Lentes progresivas. Evolución Científica hasta la quinta generación. J. M. Boix y Palación. Editorial Complutense (2000).
  Referencia b5: System for Ophthalmic Dispensing. C. Brooks, I Borish. Elsevier (2006).
  Referencia b6: Modern Ophtalmic Optics. J. Alonso, J.A. Gómez-Pedrero, J.A. Quiroga. Cambridge University Press (2019)

Additional

- Referencia c1: Lentes Oftálmicas. Problemas. J. Salvado, M. Vera, L. Guisasola y M. Fransoy. Ediciones UPC (1997).
  Referencia c2: Problemas de Tecnología Óptica. C. Illueca y B. Domenech. Ed. Universidad de Alicante (1991).
  Referencia c3: Essentials of Ophthalmic Lens Finishing. C Brooks. Elsevier (2003).