Course guide
370015 - LENTS - Ophthalmic Lenses

Last modified: 31/07/2025

Unit in charge: Terrassa School of Optics and Optometry
Teaching unit: 731 - OO - Department of Optics and Optometry.

Degree: BACHELOR'S DEGREE IN OPTICS AND OPTOMETRY (Syllabus 2020). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Fransoy Bel, Marta (https://futur.upc.edu/MartaFransoyBel)

Others: Alonso Matarín, Sílvia
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PRIOR SKILLS

To understand and integrate information on the physical and optical parameters of Ophthalmic Lenses (Q3) with respect to their ametropia compensating function, it is necessary to have knowledge, mainly, of Geometric Optics, Visual Optics and Optical Materials, subjects that are taken between Q1 and Q2 of the 2020 Study Plan of the Degree in Optics and Optometry.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE04. (ENG) The ability to understand the process of image formation and the properties of optical systems. The ability to understand aberrations in optical systems. The ability to understand radiometric and photometric fundamentals and laws.
CE06. (ENG) The ability to recognise the eye as an optical system. The ability to understand the basic models of vision. The ability to understand ocular models and parameters.
CE07. (ENG) The ability to understand and manage basic laboratory materials and techniques.
CE08. (ENG) The ability to understand light propagation in isotropic media, light-matter interactions, light interference, diffraction phenomena, the properties of single- and multi-layer surfaces and the principles and applications of lasers.

CE09. (ENG) The ability to understand the principles, descriptions and characteristics of basic optical instruments and the instruments used in optometric and ophthalmic practice.
CE10. (ENG) The ability to understand and calculate the most relevant geometric, optical and physical parameters that characterise the different kinds of ophthalmic lenses used in optometric prescriptions and to associate them with the properties involved in the fitting process. The ability to understand the processes of selecting, manufacturing and designing lenses. The ability to calculate the geometric parameters of particular visual compensation systems: vision loss, intraocular lenses, contact lenses and ophthalmic lenses.

Generical:
CG2. Carry out each stage of visual examinations effectively: medical history, selection and implementation of diagnostic tests, establishment of a prognosis, selection and execution of treatment and, if necessary, preparation of referral reports that establish levels of collaboration with other professionals, to ensure the best possible care for the patient.
CG5. Give opinions and produce reports and expert reports when necessary.
CG6. Assess and incorporate the technological improvements necessary to properly carry out professional activities.

CG14. Demonstrate knowledge, skills and abilities in patient healthcare.
CG16. Participate effectively in both single-discipline and multidisciplinary work groups on projects related to optometry.

Transversal:
CT4. (ENG) Teamwork. The ability to work as a member of an interdisciplinary team, as just another member or in a leadership role, who can contribute to developing projects pragmatically and with a sense of responsibility and make commitments that take into account the resources that are available.
CT5. Efficient use of informacion resources. To manage data and technical and scientific information adquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

TEACHING METHODOLOGY

MD1 - Participatory lecture on theoretical and practical content.
MD3 - Practical class on solving practical cases and/or exercises related to the subject content, with the participation of students.
MD4 - Laboratory practices, cooperative learning.
MD5 - Reading of teaching materials, texts and articles related to the subject content.
MD6 - Completion of problems, exercises, assignments and resolution of doubts through the Atenea virtual campus.

LEARNING OBJECTIVES OF THE SUBJECT

1. To characterize physical, geometric, and optical parameters of all types of ophthalmic lenses, and understand the design and manufacturing processes.
2. Understand the functions of ophthalmic lenses: compensation for ametropia, vergences, or postural deficiencies, eye protection, and low vision aids.
3. Interpret the results of refractive examinations to understand the characteristics of eyeglass prescriptions.
4. Individualize eyeglass prescriptions and assess aspects such as the psychoaesthetic, psychosocial, and economic impact on the wearer.
5. Determine whether eyeglasses comply with the UNE regulations for ophthalmic optics and eye protection.

STUDY LOAD

Type	Hours	Percentage
Hours small group	30,0	20.00
Hours medium group	30,0	20.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. INTRODUCTION AND CLASSIFICATION OF OPHTHALMIC LENSES.

Description:
This content covers:
- The different types of ophthalmic lenses classified according to surface geometries.
- The functionalities of the different types of lenses as compensating elements.

Related activities:
Practice 1: Ophthalmic lenses: recognition and manufacturers' catalogs.

Related competencies :
CE10. (ENG) The ability to understand and calculate the most relevant geometric, optical and physical parameters that characterise the different kinds of ophthalmic lenses used in optometric prescriptions and to associate them with the properties involved in the fitting process. The ability to understand the processes of selecting, manufacturing and designing lenses. The ability to calculate the geometric parameters of particular visual compensation systems: vision loss, intraocular lenses, contact lenses and ophthalmic lenses.

CE08. (ENG) The ability to understand light propagation in isotropic media, light-matter interactions, light interference, diffraction phenomena, the properties of single- and multi-layer surfaces and the principles and applications of lasers.

CE09. (ENG) The ability to understand the principles, descriptions and characteristics of basic optical instruments and the instruments used in optometric and ophthalmic practice.
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CG5. Give opinions and produce reports and expert reports when necessary.
CG6. Assess and incorporate the technological improvements necessary to properly carry out professional activities.

CT5. Efficient use of informacion resources. To manage data and technical and scientific information adquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

Full-or-part-time: 9h
Theory classes: 2h
Laboratory classes: 2h
Self study : 5h

2. SPHERICAL POWER LENSES.

Description:
This content covers:
- Geometric and optical parameters that characterize spherical lenses.
- Relationships between parameters.
- Accurate calculation of spherical power lenses.
- Procedures for measuring these parameters. Use of the frontofocometer, the spherometer and the sagitmeter.

Related activities:
- Resolution of proposed exercises.
- PRACTICE 2.- Spherical lenses: measurement of powers with frontofocometer and spherometer.
- PRACTICE 3.- Spherical lenses: measurement of geometric parameters of spherical lenses with sagimeter.
- PRACTICE 4.- High power spherical lenses.

Related competencies :
CE10. (ENG) The ability to understand and calculate the most relevant geometric, optical and physical parameters that characterise the different kinds of ophthalmic lenses used in optometric prescriptions and to associate them with the properties involved in the fitting process. The ability to understand the processes of selecting, manufacturing and designing lenses. The ability to calculate the geometric parameters of particular visual compensation systems: vision loss, intraocular lenses, contact lenses and ophthalmic lenses.

CE04. (ENG) The ability to understand the process of image formation and the properties of optical systems. The ability to understand aberrations in optical systems. The ability to understand radiometric and photometric fundamentals and laws.
CE08. (ENG) The ability to understand light propagation in isotropic media, light-matter interactions, light interference, diffraction phenomena, the properties of single- and multi-layer surfaces and the principles and applications of lasers.

CE07. (ENG) The ability to understand and manage basic laboratory materials and techniques.
CE09. (ENG) The ability to understand the principles, descriptions and characteristics of basic optical instruments and the instruments used in optometric and ophthalmic practice.
CE06. (ENG) The ability to recognise the eye as an optical system. The ability to understand the basic models of vision. The ability to understand ocular models and parameters.
CG16. Participate effectively in both single-discipline and multidisciplinary work groups on projects related to optometry.

CG5. Give opinions and produce reports and expert reports when necessary.
CG2. Carry out each stage of visual examinations effectively: medical history, selection and implementation of diagnostic tests, establishment of a prognosis, selection and execution of treatment and, if necessary, preparation of referral reports that establish levels of collaboration with other professionals, to ensure the best possible care for the patient.
CG6. Assess and incorporate the technological improvements necessary to properly carry out professional activities.

CG14. Demonstrate knowledge, skills and abilities in patient healthcare.
CT5. Efficient use of informacion resources. To manage data and technical and scientific information adquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management
CT4. (ENG) Teamwork. The ability to work as a member of an interdisciplinary team, as just another member or in a leadership role, who can contribute to developing projects pragmatically and with a sense of responsibility and make commitments that take into account the resources that are available.

Full-or-part-time: 24h
Theory classes: 4h
Laboratory classes: 6h
Self study : 14h

3. ASTIGMATIC POWER LENSES.

Description:
This content covers:
- Geometric description of surfaces.
- Relationships between optical and geometric parameters.
- Methods for representing this type of lenses.
- Application of bicylindrical lenses. Stokes' theorem.
- Procedures for measuring parameters. Handling the frontofocometer.

Related activities:
- Resolution of proposed exercises.
- LAB WORK 5.- Astigmatic lenses: measurement of geometric parameters with a torometer.
- LAB WORK 6.- Astigmatic lenses: measurement of powers and their relationship to geometric parameters.
- LAB WORK 7.- Astigmatic lenses: obtaining the spherocylindrical formula with a lensometer.

Related competencies :
CE10. (ENG) The ability to understand and calculate the most relevant geometric, optical and physical parameters that characterise the different kinds of ophthalmic lenses used in optometric prescriptions and to associate them with the properties involved in the fitting process. The ability to understand the processes of selecting, manufacturing and designing lenses. The ability to calculate the geometric parameters of particular visual compensation systems: vision loss, intraocular lenses, contact lenses and ophthalmic lenses.

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Full-or-part-time: 29h
Theory classes: 4h
Laboratory classes: 6h
Self study : 19h

4. PRISMATIC POWER LENSES.

Description:
This content covers:
- Concept and methods of measuring prismatic power.
- Methods for obtaining a prismatic lens.
- Prentice's Law.
- Convention of the bases.
- Prismatic effects obtained by decentring.

Related activities:
- Resolution of proposed exercises.
- PRACTICE 8.- Prisms in spherical lenses.
- PRACTICE 9.- Prisms in astigmatic lenses.

Related competencies :
CE10. (ENG) The ability to understand and calculate the most relevant geometric, optical and physical parameters that characterise the different kinds of ophthalmic lenses used in optometric prescriptions and to associate them with the properties involved in the fitting process. The ability to understand the processes of selecting, manufacturing and designing lenses. The ability to calculate the geometric parameters of particular visual compensation systems: vision loss, intraocular lenses, contact lenses and ophthalmic lenses.

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Full-or-part-time: 24h
Theory classes: 4h
Laboratory classes: 4h
Self study : 16h

5. BIFOCAL LENSES.

Description:
This content covers:
- Geometries of bifocal lenses linked to their functionality.
- Concepts of addition, image jump and optical center for near vision.

Related activities:
- Resolution of proposed exercises.
- PRACTICE 10.- Bifocal lenses: identification and powers.

Related competencies :
CE10. (ENG) The ability to understand and calculate the most relevant geometric, optical and physical parameters that characterise the different kinds of ophthalmic lenses used in optometric prescriptions and to associate them with the properties involved in the fitting process. The ability to understand the processes of selecting, manufacturing and designing lenses. The ability to calculate the geometric parameters of particular visual compensation systems: vision loss, intraocular lenses, contact lenses and ophthalmic lenses.

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CG16. Participate effectively in both single-discipline and multidisciplinary work groups on projects related to optometry.

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Full-or-part-time: 11h
Theory classes: 2h
Laboratory classes: 2h
Self study : 7h

6. PROGRESSIVE ADDITION LENSES.

Description:
This content covers:
- Description of surfaces.
- Recognition and obtaining of parameters.
- Advantages and disadvantages of bifocal lenses.

Related activities:
- Personal work on documentation and exercices related to the topic.
- PRACTICE 11.- Progressive addition lenses. Identification, powers and tracing cards.

Related competencies :
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Full-or-part-time: 16h
Theory classes: 4h
Laboratory classes: 2h
Self study : 10h

7. DESIGN OF MONOFOCAL OPHTHALMIC LENSES.

Description:
This content covers:
- Definition and classification of the different aberrations to be considered in an ophthalmic lens.
- Mathematical models for simulating aberrations related to lens design.
- Quality functions.

Related activities:
- Resolution of proposed exercises.
- PRACTICE 12.- Design and manufacture of ophthalmic lenses and eye protection lenses. NON-PRESENTIAL

Related competencies :
CE10. (ENG) The ability to understand and calculate the most relevant geometric, optical and physical parameters that characterise the different kinds of ophthalmic lenses used in optometric prescriptions and to associate them with the properties involved in the fitting process. The ability to understand the processes of selecting, manufacturing and designing lenses. The ability to calculate the geometric parameters of particular visual compensation systems: vision loss, intraocular lenses, contact lenses and ophthalmic lenses.

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Full-or-part-time: 10h
Theory classes: 4h
Self study : 6h

8. MANUFACTURE OF OPHTHALMIC LENSES AND SURFACE COATING.

Description:
This content covers:
- Different types of manufacturing processes.
- Cutting and polishing surfaces with revolution symmetry around a point or axis.
- Cutting and polishing surfaces without revolution symmetry.
- Surface treatments.

Related competencies :
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Full-or-part-time: 6h
Theory classes: 2h
Self study : 4h

9. EYE PROTECTION LENSES.

Description:
This topic deals with radiation protection filters and their application for eye protection. The contents that are developed are:

- The electromagnetic spectrum and its effect on eye structures.
- Need for eye protection: analysis of injury risks.
- Physical and optical requirements of the protective filter.
- Types of filters: by reflection, by absorption, polarized, photochromic and therapeutic.
- Legal regulation: European regulations.

Related activities:
- PRACTICE 12.- Design and manufacture of ophthalmic lenses and eye protection lenses.

Full-or-part-time: 12h
Theory classes: 2h
Laboratory classes: 2h
Self study : 8h

10. LAB ASSESSMENT EXAM (PAL)

Description:
content english

Full-or-part-time: 7h
Laboratory classes: 2h
Self study : 5h

11. THEORY ASSESSMENT (PAC1+PAC2)

Description:
content english

Full-or-part-time: 2h
Theory classes: 2h

ACTIVITIES

EUROPEAN DIPLOMA IN OPTOMETRY COMPETENCES

Description:
This module contributes to the European Diploma in Optometry competencies indicated in the following link:
https://drive.google.com/drive/folders/1bwmHBsvkrGnY63DfXAnWZB_i0I2pXa-I?usp=drive_link

GRADING SYSTEM

For the Final Grade (CF) of the subject, the results of the following evaluation elements will be taken into account:
- First Continuous Assessment Test (PEC1): 30%
- Second Continuous Assessment Test (PEC2): 35%
- Laboratory Assessment Test (PEL): 20%
- Reports and Results of Practices (IRP): 15%

CF = 0.30 PEC1 + 0.35 PEC2 + 0.20 PEL + 0.15 IRP

The information on the different evaluation activities will be detailed annually on the subject's intranet (Atenea digital campus) and will be discussed in the first face-to-face teaching session.

RE-EVALUATION: it will consist of a single written test that will include both theory and problems, as well as laboratory practices (100%)

EXAMINATION RULES.

All submissions must be made in accordance with the guidelines indicated on the course intranet (Atenea digital campus).

Irregular actions that may lead to a significant change in the grade of one or more students constitute fraudulent performance of an assessment.

This action entails a descriptive grade of fail and a numerical grade of 0 for the assessment and the course, without prejudice to any disciplinary process that may arise as a result of the actions taken.

If the student considers the decision to be incorrect, they may file a complaint with the dean of the school and, if the response is not satisfactory, they may appeal to the rector.

The total or partial reproduction of academic or research works, or their use for any other purpose, must have the explicit authorization of the authors.

The dean of the school is responsible for resolving allegations regarding aspects not covered by the regulations.

BIBLIOGRAPHY

Basic:
- Caum Aregay, Jesús [et al.]. Tecnología óptica: lentes oftálmicas, diseño y adaptación [on line]. Barcelona: Edicions UPC, 2001 [Consultation: 24/07/2024]. Available on: http://hdl.handle.net/2099.3/36343. ISBN 8483014742.
- Fannin, Troy E; Grosvenor, Theodore P. Óptica clínica. 2ª ed. Barcelona: Omega, 2007. ISBN 9788428214223.
- Jalie, M. The principles of ophthalmic lenses. 4th ed. London: The Association of Dispensing Opticians, 1984. ISBN 0900099208.
- Jalie, M. Ophthalmic lenses & dispensing. 3rd ed. Oxford [etc.]: Butterworth Heinemann Elsevier, 2008. ISBN 9780750688949.
- Alonso, J.; Gómez-Pedrero, J.A.; Quiroga, J.A. Modern ophthalmic optics [on line]. Cambridge: Cambridge University Press, 2019 [Consultation: 05/07/2024]. Available on: https://www-cambridge-org.recursos.biblioteca.upc.edu/core/books/modern-ophthalmic-optics/43131A76A2333173E280CC17662B01B4. ISBN 9781316275474.

Complementary:
- Rosenthal, J. William. Spectacles and other vision aids : a history and guide to collecting. San Francisco: Norman Publishing, 1996. ISBN 0930405714.

RESOURCES

Other resources:
- Documentation on the Atenea virtual campus.
- Collections of problems.

- Videos from the ophthalmic optics laboratories.
- Online programs:
- Spectacle Optics (https://opticampus.opti.vision/tools/spectacle_optics.php) /> - Prats OnlineWeb (https://www.opticaprats.com/MiPortal/OnlineWeb/index.php) />- Practice scripts.
- Manufacturers' catalogs.
- Practice portfolio.