COURSE DATA

DATA SUBJECT

Code: 34321
Name: Advanced techniques for prescription management
Cycle: Undergraduate Studies
ECTS Credits: 9
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1207 - Degree in Optics and Optometry	Facultat de Física	4	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1207 - Degree in Optics and Optometry	Advanced optometry	ELECTIVES

COORDINATION

MICO SERRANO VICENTE

SUMMARY

In optometry and treat the detection, analysis and compensation of refractive visual dysfunctions in nature, is also valued and performs management and counseling of other situations / dysfunctions "special" for the conservation, improvement, maintenance and performance optimization visual in specific populations.

The course Advanced Techniques in Management Prescription (TAMP) is an optional subject in the first quarter of the 4th year that aims to provide students with the Bachelor in Optometry from a range of knowledge and functional tools and valid for analysis and the advanced management the optometric prescription.

To this end, we will analyze in depth two additional tools to conventional sphero-cylindrical formula of refraction optometric that provide new features and capabilities in managing the prescription. We're talking about the refraction vector and the wavefront aberration.

Having established the theoretical foundations for both modalities, clinical cases will be discussed both through practical application examples given by the teacher in the lectures and in seminars. In this line, this course also includes a section dedicated to the study of the importance of the tear film from the point of view of the optical quality of the visual system as well as the importance of analyzing aberrations after refractive surgery and contact lens wearers contact.

Similarly, international publications will be used in different research groups as examples of application of the different formalisms studied

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

It is recommended for students enrolled in TAMP having previously taken and passed the following subjects of the Degree of Optometry:
Physiological Optics.
Ophthalmic Optics.
Physics II.
Mathematics.

And to a lesser degree, have had training and / or knowledge of:
Physical Optics.
Contact Lenses.
Contact Lenses II.
Physics I.
Mathematics

COMPETENCES / LEARNING OUTCOMES

1207 - Degree in Optics and Optometry

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.

Clinical study of optical aberrations in the eye: metrics

Development of learning skills necessary to undertake further studies with a high degree of autonomy.

Knowing how to apply the knowledge acquired to professional activity, knowing how to solve problems and develop and defend arguments.

Management of spherocylindrical and vector refraction.

To be able to provide visual aids based on the findings and reports submitted.

To become familiar with the preoperative and postoperative action protocol in cataract and refractive surgery.

To distinguish the different characteristics and applications of each instrument.

To have and to understand the fundamentals of Optometry for its correct clinical and healthcare application.

To know how to select the most appropriate test for each patient and particular pathology.

To know the advances in prescriptions with contact lenses.

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 different techniques to modify the refractive state of the eye.

To know the indications and contraindications of refractive surgery techniques.

To know the latest research in the fields of Optics, Optometry and Vision Sciences.

To know the optimal conditions of use of each of them as well as their limitations.

To know the types of refractive and presbyopia surgery and how they affect vision and compensation for residual refractive errors.

To provide the necessary knowledge for the understanding of the excimer laser, photorefractive keratectomy, intrastomal rings and other refractive surgery techniques.

DESCRIPTION OF CONTENTS

1. Vectorial calculation of refraction

1. Introduction to the vector notation of ocular refraction: Why is it interesting to develop a vector formalism?
2. Mathematical definition: meridional power based on Euler's theorem.
3. Fourier's interpretation of meridional power.
4. Transposition between polar and rectangular forms.
5. Background of the vector formalism: a. Gartner's optometric vectors. b. Humphrey's astigmatic decomposition. c. Harris's vector notation.
6. Dioptric power as a vector: 3D representation of dioptric power.
7. Examples of application of the vector formalism.
8. Optometric applications of the vector formalism: a. Vectorial Javal's rule. b. Visual acuity from a

vector point of view. c. Meridional refraction according to the vector formalism. d. Vectorial refraction in a laboratory: i. Barnes' method. ii. Vectorial refraction from the pinhole slit. iii. Subjective vector refraction with JCCs or a Stokes lens. iv. Retinoscopy in vector space. v. Vectorial keratometry. vi. Vectorial frontophocometry. e. Jackson's crossed cylinders in vector space. f. Propagation of astigmatic wavefronts using dioptric power vectors.

9. Practical application exercises of the vector formalism: a. Composition of spherocylindrical prescriptions. b. Monitoring changes in ocular refraction. c. Overrefraction calculations and refractive error assessment.
10. Clinical cases of practical application of vector formalism: a. Subjective refraction in irregular corneas. b. Fitting toric contact lenses. c. Refractive surgery with a toric intraocular lens. d. Evaluation of refractive change after corneal surgery.

2. Matrix Calculation on refraction

1. Introduction to the vector notation of ocular refraction: Why is it interesting to develop a vector formalism

2. Mathematical definition: meridional power based on Euler's theorem.

3. Fourier's interpretation of meridional power.

4. Transposition between polar and rectangular forms.

5. Background of the vector formalism: a. Gartner's optometric vectors. b. Humphrey's astigmatic decomposition. c. Harris's vector notation.

6. Dioptric power as a vector: 3D representation of dioptric power.

7. Examples of application of the vector formalism.

8. Optometric applications of the vector formalism: a. Vectorial Javal's rule. b. Visual acuity from a vector point of view. c. Meridional refraction according to the vector formalism. d. Vectorial refraction in a laboratory: i. Barnes' method. ii. Vectorial refraction from the pinhole slit. iii. Subjective vector refraction with JCCs or a Stokes lens. iv. Retinoscopy in vector space. v. Vectorial keratometry. vi. Vectorial frontophocometry. e. Jackson's crossed cylinders in vector space. f. Propagation of astigmatic wavefronts using dioptric power vectors.

9. Practical application exercises of the vector formalism: a. Composition of spherocylindrical prescriptions. b. Monitoring changes in ocular refraction. c. Overrefraction calculations and refractive error assessment.

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3. Prescription from aberrometry

1. Introduction to the concept of metrics.
2. Metrics for measuring the optical quality of the eye. a. Wavefront. b. Point transfer function (PSF) c. Modulation transfer function (MTF) d. Other descriptors.
3. Optical aberrations in the eye: classification and analysis of the most important aberrations.
4. Factors affecting spatial vision: a. Physical limit: aberrations and diffraction. b. Physiological limit: sampling of photoreceptors in the retina.
5. Wavefront aberration: concept and measurement. a. Basic concept. b. Measurement systems: aberrometers. c. Adaptive optics based on wavefront technology.
6. Prescription measurement from aberrometric measurements. a. Zernike polynomials. b. Representation of aberrations. c. Calculation of vector refraction from Zernike coefficients. d. Calculation of spherocylindrical refraction from Zernike coefficients.

4. Cabinet practices

Practice 1. Objective vector refraction in the office: retinoscopy in vector space (pinhole slit).

Practice 2. Subjective vector refraction in the office: vector refraction from a pinhole slit and/or a new 3-step vector refraction method.

Practice 3: Application of vector formalism to optometric instrumentation: vector keratometry and frontophocometry.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	15,00
Theory	60,00
Other activities	15,00
Total hours	**90,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	2,00
Independent study and work	45,00
Preparation of lessons	28,00
Preparation for assessment activities	60,00
Resolution of case studies	0,00
Total hours	**135,00**

TEACHING METHODOLOGY

Theoretical and practical classes: class-campus (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. Exercises will develop practical application of theoretical contents.

Small Group Theory sessions: These sessions dedicated to student group work, with suggested exercises 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 laboratory. These classes, small group of maximum 16 students, will take place using many real systems such as virtual labs that can develop the student interactively.

Student work

- Theoretical study

- Development of work and issues raised in class

- Individual tutorials

- Individual tutorials in cabinet
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- Individual tutorials

- Individual tutorials in cabinet\"\"hps\"\"">in cabinetdiv>

EVALUATION

The course assessment consists of four different types:

1. Theoretical-practical exam: This exam assesses the student's understanding of the theoretical and conceptual aspects and formal framework of the subject, both through theoretical questions and through conceptual and numerical questions or simple case studies. Appropriate argumentation and justification will be assessed, as well as critical thinking skills regarding the results obtained. This section constitutes 50% of the total grade for the course, with a minimum score of 3.5 points out of 10 required to average the remaining assessment items.
2. Continuous assessment: This exam assesses the student's degree of progressive learning during the coursework through the completion of small, periodic monitoring exercises, as well as through voluntary work done by the student in seminars and in solving exercises and problems in theoretical and practical classes. Students' effort and work, both individual and group, will be assessed. For students who cannot attend class for justifiable reasons and do not pass the continuous assessment methods described above, an extra question will be assigned to the exam day, allowing for additional time to qualify for this assessment. This section constitutes 20% of the total grade for the course. The student must attend and participate in the in-person sessions.
3. Completion of an assignment: The student is expected to complete a personal project derived from a scientific publication related to a specific topic covered in the course. The assignment will be chosen from a list of assignments provided by the instructor and will involve an oral presentation. This section constitutes 15% of the total grade for the course.
4. Practical Assessment: The student will evaluate the degree of practical understanding of the three practical sessions conducted in the laboratory through the preparation of a practical report. This section constitutes 15% of the total grade for the course.If the student fails the first sitting, they will be required to take all the assessment items specified for the second sitting. However, students may choose to reserve the marks from sections 2, 3, and 4 above whenever they deem it appropriate (although it may also be advisable to take the assessment for these items). In this case, they would only need to retake the theory exam, achieving the established minimum cut-off mark, in order to average the remaining items and pass the course.

REFERENCES

- Reference b1: R. Montés-Micó. 'Optometría. Principios básicos y aplicación clínica'. Elsevier (2011)
- Reference b2: V. Mico, C. Albarran, L. Thibos. Power Vectors for the Management of Astigmatism: From Theoretical to Clinical Applications. Capítulo 2 del libro Astigmatism: Types, Diagnosis and Treatment Options, Nova Publishers (2014).
- Reference b3: W. Furlan, J. García Monreal, L. Muñoz Escrivá. 'Fundamentos de optometría: refracción ocular'. 2ª Edición. Publi. Universitat Valencia (2009)
- Reference c1: Artículos seleccionados de distintas revistas especializadas: Journal of Optometry, Vision Research, Opthalmic and Physiological Optics, Optometry and Vision Science, Investigative Ophthalmology and Vision Science, etc.
- Reference c2: J. Gispets, J. Merayo-Lloves, R. González, G. Rodríguez, N. López, C. Villa. Aberraciones oculares: aspectos clínicos. Colegio Nacional de Ópticos-Optometristas de España (2005)

- Reference c3:T. E. Fannin and T. Grosvenor T. 'Clinical Optics' Ed. Butterworth-Heinemann (1996).
- Reference c4: M. Jalie. 'The principles of Ophtalmic Lenses' (1998).
- Reference c5: W. Benjamin. Borish's Clinical Refraction. 2ª Edición. Butterworth-HeinemannPublishers (2006)