VNIVERSITAT DE VALÈNCIA

# Course Guide
# 34321 Advanced techniques for prescription management

## COURSE DATA

| Data Subject | |
|---|---|
| **Code** | 34321 |
| **Name** | Advanced techniques for prescription management |
| **Cycle** | Grade |
| **ECTS Credits** | 9.0 |
| **Academic year** | 2019 - 2020 |

**Study (s)**

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 1207 - Degree in Optics and Optometry | Faculty of Physics | 4 | First term |

**Subject-matter**

| Degree | Subject-matter | Character |
|---|---|---|
| 1207 - Degree in Optics and Optometry | 16 - Optional subjects | Optional |
| 1207 - Degree in Optics and Optometry | 21 - Advanced optometry | Optional |

**Coordination**

| Name | Department |
|---|---|
| MICO SERRANO, VICENTE | 280 - Optics and Optometry and Vision Sciences |

## 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

## 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 how to select the most appropriate test for each patient and particular pathology.
- To be able to provide visual aids based on the findings and reports submitted.
- To distinguish the different characteristics and applications of each instrument.
- To know the optimal conditions of use of each of them as well as their limitations.
- Management of spherocylindrical and vector refraction.
- Clinical study of optical aberrations in the eye: metrics
- To know the types of refractive and presbyopia surgery and how they affect vision and compensation for residual refractive errors.
- To know the advances in prescriptions with contact lenses.
- To know the different techniques to modify the refractive state of the eye.
- To become familiar with the preoperative and postoperative action protocol in cataract and refractive surgery.
- To provide the necessary knowledge for the understanding of the excimer laser, photorefractive keratectomy, intrastomal rings and other refractive surgery techniques.
- To know the indications and contraindications of refractive surgery techniques.
- To know the latest research in the fields of Optics, Optometry and Vision Sciences.

## LEARNING OUTCOMES

Following the completion and positive evaluation of the course, students will have acquired the following skills:

Basic theoretical knowledge of the fundamentals of the refraction vector.
Management of refraction and vector esferocilíndrica different clinical situations.

Interpretation of optometric tests from a standpoint of refraction.
Clinical and theoretical study of different metrics to characterize the optical quality of the human visual system.
Familiarity with the use of Zernike polynomials to the analysis of ocular aberrations.
Set both pen-cylindrical prescription and vector from measurements aberrometer.
Acquiring skills in management and analysis of publications related to the theme of the course.
Reported developments in refractive surgery from a personal point of view aberrometer.
Prescriptions about the advances in customized contact lenses.
Establish the optimum compensation

## DESCRIPTION OF CONTENTS

### 1. Vectorial calculation of refraction

1. Introduction to vector notation of ocular refraction: why is interesting to develop a vector formalism?
2. Mathematical definition: Southern power from Euler's theorem.
3. Interpreting Southern Fourier power.
4. 3D rendering of dioptric power.
5. Transposition between polar and rectangular forms.
6. The dioptric power as a vector.
7. Applications optometric vector formalism:
a. Javal rule vector.
b. Application to the analysis of astigmatism.
c. Visual acuity from a vector viewpoint.
d. Southern Refraction as vector formalism.
e. Refraction vector cabinet.
f. Jackson cross cylinders in the vector space.
8. Practical application exercises vector formalism:
a. Composition of sphero-cylindrical prescriptions.
b. Monitoring changes in ocular refraction.
c. Overrefraction calculations and evaluation of refractive errors.

### 2. Matrix Calculation on refraction

1. Introducing the matrix notation of ocular refraction.
2. Long-matrix formalism of dioptric power. Keating equations.
3. The convergence matrix.
4. Composition sphero-cylindrical lens in matrix notation.
5. Dioptric power as the sum matrix of a spherical lens matrix and a matrix of crossed cylinder Jackson.
6. 3D representation of the dioptric power matrix.
7. The matrix of dioptric power for systems in general.
8. The space dioptric power and the astigmatism subspace.
9. Asymmetric dioptric power matrices and thick lenses.
10. Dioptric power matrix asymmetric standard notation.
11. Interpretation of the degree of asymmetry.

12. Basic equations of physiological optics in vector and matrix formalism.
13. Practical application exercises matrix formalism:
d. Composition of sphero-cylindrical prescriptions.
e. Monitoring changes in ocular refraction.
f. Overrefraction calculations and evaluation of refractive errors.

## 3. Prescription from aberrometry

1. Introduction to the concept of metrics.
2. Metrics for measuring the optical quality of the eye.
a. Wavefront.
b. Transfer function of a point (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. Measuring systems: aberrometers.
c. Based adaptive optics wavefront technology.
6. Measure from prescription aberrométricas measures.
a. Zernike polynomials.
b. Representation of aberrations.
c. Calculation of refraction vector from Zernike coefficients.
d. Calculation of sphero-cylindrical refractive from Zernike coefficients.
7. Applications eye aberrométricas measures: importance of the tear film in the optical quality of the eye:
a. Methods for visualizing the tear film.
b. Studies based on PSF and MTF.
c. Studies based on aberrations.
d. Studies based on interferometry.
8. Ocular applications aberrométricas measures: aberration and refractive surgery.
e. Introduction: aberrations in the eye not intervened.
f. Aberrations after myopic LASIK.
g. Aberrations after hyperopic LASIK.
h. Changing corneal asphericity after refractive surgery.
i. Customized Refractive Surgery and aberrations.
9. Applications eye aberrométricas measures: aberrometry and contact lenses.
j. Influence of different types of contact lenses (soft RPG) on aberrations.
k. Spherical lenses and aspherical.
l. Customized contact lenses and aberrations.

### 4. Cabinet practices

Practice 1. Objective refraction using power vectors: retinoscopy with stenopaeic slit.
Practice 2. Subjective refraction using power vectors: subjective refractive routine with stenopaeic slit and/or new method for subjective refraction based on 3 steps.
Practice 3. Queratometry and lensometry using power vectors.

## WORKLOAD

| ACTIVITY | Hours | % To be attended |
|---|---|---|
| Theory classes | 60,00 | 100 |
| Tutorials | 15,00 | 100 |
| Other activities | 15,00 | 100 |
| Development of group work | 15,00 | 0 |
| Development of individual work | 15,00 | 0 |
| Study and independent work | 30,00 | 0 |
| Readings supplementary material | 10,00 | 0 |
| Preparation of evaluation activities | 30,00 | 0 |
| Preparing lectures | 15,00 | 0 |
| Preparation of practical classes and problem | 15,00 | 0 |
| **TOTAL** | **220,00** | |

## 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

## EVALUATION

The evaluation of the course covers four different modes:

Review of theoretical and practical: To assess the understanding of the theoretical and conceptual formalism of matter, both through theoretical questions through conceptual questions and numerical or simple special cases in which a correct argument will be assessed and appropriate justification, and the critical capacity to the results obtained.
This section constitutes 50% of the total grade of the course still required a minimum score of 3.5 out of 10 to consider the rest of the evaluation items.

Continuous assessment based on the work done both in seminaries and in solving exercises and problems in theoretical and practical classes. Itwill assess the work effort and personal and student group.
This section constitutes 20% of the total grade for the course, it being necessary
for the student's attendance and participation in the sessions.

Conducting a job: the realization is planned by the student's personal work derived from some specific content addressed in class. The choice of work will be agreed between the student and the teacher, and will involve making a small written report and a brief oral presentation of it.
This section constitutes 15% of the total grade for the course.

Evlauation of the practical sesions by means of a laboratory memory containing all the data/explanations/analysis/etc of the practical sesions. This item contitutes 15% of the total qualification.

## REFERENCES

### Basic

- Referencia b1: R. Montés-Micó. Optometría. Principios básicos y aplicación clínica. Elsevier (2011)
  Referencia b2: 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)
  Referencia b3: W. Benjamin. Borish's Clinical Refraction. 2ª Edición. Butterworth-Heinemann

Publishers (2006)
Referencia b4: W. Furlan, J. García Monreal, L. Muñoz Escrivá. Fundamentos de optometría: refracción ocular. 2ª Edición. Publi. Universitat Valencia (2009)

10.2 Referencias Complementarias

Referencia c1: T. E. Fannin and T. Grosvenor T. Clinical Optics Ed. Butterworth-Heinemann (1996).
Referencia c2: M. Jalie. The principles of Ophtalmic Lenses (1998).
Referencia c3: 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.

- 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).

## ADDENDUM COVID-19

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

## English version is not available