Course guide
370009 - OTIVIS - Visual Optics

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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, Spanish

LECTURER

Coordinating lecturer: Pujol Ramo, Jaume (https://futur.upc.edu/JaumePujolRamo)

Others: Alvarez Muñoz, José Luis (https://futur.upc.edu/JoseLuisAlvarezMunoz)
Vilaseca Ricart, Meritxell (https://futur.upc.edu/MeritxellVilasecaRicart)

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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.

Generical:
CG9. Expand and update one’s professional abilities through continuing education.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of 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.

TEACHING METHODOLOGY

Methodology in directed learning hours (theory/practice).
MD01. Participatory expository class on theoretical and practical content.
MD03. Practical class on solving practical cases and/or exercises related to the subject content, with the participation of students.
MD04. Laboratory practices.
MD05. Reading of teaching materials, texts and articles related to the subject content.
MD06. Completion of problems, exercises and assignments, and resolution of doubts through the Atenea virtual campus.
MD07. Tutorials.

Tasks in independent learning hours:
Study of the contents of the theory classes.
Completion of problems before classes and review and study of the resolution of the problems after class.
Preliminary reading and study of the practice scripts before the laboratory sessions.
Completion of the practice questionnaires. Completion of classroom exercises.
Consult the recommended bibliography.
Reading of articles related to the subject content. Preparation for theory and practical exams.

Conditions for access to the laboratory:
Having read and studied the practical script before the laboratory session.

To properly follow the subject, it is essential to consult Atenea frequently and actively participate in the forums for questions and queries.

LEARNING OBJECTIVES OF THE SUBJECT

Knowing the eye as an optical system.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	45,0	30.00
Hours small group	15,0	10.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1.-INTRODUCTION TO VISUAL OPTICS

Description:
This content works on:
The concept of visual optics; visual optics as a foundation for optometry; the visual process: visual perception; brief review of geometric optics applied to the eye.

Related activities:
Evaluation activities: PEC1, PAL, EA

Full-or-part-time: 1h 45m
Practical classes: 1h
Self study : 0h 45m

title english

Description:
This content works on:
Type of visual acuity; clinical visual acuity; visual acuity scales; charts and optotype projectors; conditions for the measurement of clinical VA; standards for the measurement of clinical VA; contrast sensitivity function; the function of contrast sensitivity in clinical practice; peripheral visual acuity; amblyopia

Related activities:
Activitats de laboratori 1 i 2; activitats d'avaluació: PAC1, PAL, EA; CDE.

Related competencies :
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one's professional abilities through continuing education.

Full-or-part-time: 20h
Practical classes: 6h
Laboratory classes: 6h
Self study : 8h

3.- OPTICAL PROPERTIES OF THE EYE AND IMAGES FORMED BY THE EYE

Description:
In this content we work on: OPTICAL PROPERTIES OF THE EYE
Refractive components of the eye: cornea and lens; the pupil; the retina: leads to visual perception; the visual field; fundamentals of schematic and advanced models of the eye; the reduced theoretical eye; transparency of the ocular media.
IMAGES FORMED BY THE EYE
Types of images formed by the eye; the dioptric and retinal image; depth of focus, clinical application; Purkinje imaging, clinical application.

Related activities:
Laboratory activities 3 and 4; assessment activities: PAC1, PAL, EA; CDE.

Related competencies :
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.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one's professional abilities through continuing education.

Full-or-part-time: 17h
Practical classes: 6h
Laboratory classes: 4h
Self study : 7h

4.- AMETROPIA OR REFRACTIVE ERROR AND ITS NEUTRALIZATION

Description:
This content works on:
AMETROPIAS OR REFRACTIVE ERROR
Importance of refractive error; spherical ametropia; classification of ametropia; retinal image size in spherical ametropia; degree of blurring.
OPTICAL NEUTRALIZATION OF AMETROPIA OR REFRACTIVE ERROR
Type of neutralization; principle and value of neutralization; neutralization tolerance; neutralization with ophthalmic lenses; neutralization with contact lenses; contact lens optics; bases of neutralization with refractive surgery; retinal image size; lens magnification and relative lens magnification; how the value of neutralization is determined in clinical practice.
Astigmatism
Definition and causes; classification of astigmatism; image formation in the astigmatic eye; Sturm's conoid; retinal image; neutralization of astigmatism; spherocylindrical formula of an astigmatic lens; subjective neutralization of astigmatism with negative cylinder.

Related activities:
Laboratory activities 5, 6 and 7; assessment activities: PAC2, PAL, EA; CDE.

Related competencies :
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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
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.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one’s professional abilities through continuing education.

Full-or-part-time: 35h 45m
Practical classes: 17h
Laboratory classes: 3h
Self study : 15h 45m

5. ACCOMMODATION AND PRESBYOCIA

Description:
This content works on:
ACCOMMODATION
Concept and definition; breadth and route of accommodation; eye modifications in accommodation; retinal image size in the accommodative eye; accommodative stimulus and accommodative response, delay in accommodation; accommodating tracks; microfluctuations of accommodation; farsightedness and accommodation; myopia due to inadequate stimulation.
PRESBYOPIA
Concept and definition; variations in accommodation with age; neutralization of presbyopia: type; neutralization with ophthalmic lenses: bifocal and progressive lenses; neutralization with contact lenses: monovision and multifocality; neutralization with refractive surgery: monovision and multifocality; how the value of the addition is determined in clinical practice.

Related activities:
Laboratory activity 8; assessment activities: PAC2, PAL, EA; CDE.

Related competencies :
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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
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.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one’s professional abilities through continuing education.

Full-or-part-time: 23h
Practical classes: 11h
Laboratory classes: 2h
Self study : 10h

6.- OPTICAL QUALITY OF THE RETINAL IMAGE

Description:
This content works on:
Factors affecting ocular optical quality; aberrations; measurement of aberrations in the eye; chromatic aberration: the Duochrome test; dissemination; cataracts; measurement of intraocular diffusion; clinical significance.

Related activities:
Assessment activities: PAL, EA; CDE.

Related competencies :
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.
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one’s professional abilities through continuing education.

Full-or-part-time: 7h
Practical classes: 4h
Self study : 3h

ACTIVITIES

1.- LABORATORY. VISUAL ACUITY (Content 2)

Description:
Practice to be done in the laboratory, in pairs, with a duration of 2 hours. In the laboratory the experimental part must be carried out, and as directed independent learning it is planned that the students will do a preliminary reading of the script and answer the corresponding questionnaire to identify the objectives, from the point of view of the learning outcomes which must be achieved after experimentation. Afterwards, the teacher does an oral check, using questions, before the experiment, to identify pre-laboratory learning.

Specific objectives:
At the end of the internship, students must be able to:
Calculate the visual acuity corresponding to different detection criteria; determine the influence on clinical visual acuity of some factors such as the type of test and the contrast; recognize the different scales of clinical visual acuity and move from one to the other; master the use of optotype charts at distances different from those of the calibration.

Material:
All the material to do the experiment is in the laboratory. Detailed script with the questionnaire and subject notes, available at Atenea.

Delivery:
Registration by the teacher of the verification of the student's independent learning and the work in the laboratory and questionnaire with the results of the experiment at the end of the session. It is returned corrected and with the corresponding feedback from the teacher in the following session.

Related competencies :
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
CG9. Expand and update one’s professional abilities through continuing education.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
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: 3h
Laboratory classes: 2h
Self study: 1h

2. LABORATORY. PERIPHERAL VISUAL ACUITY (content 2)

Description:
Practice to be done in the laboratory, in pairs, with a duration of 2 hours. In the laboratory, the experimental part must be carried out, and as directed independent learning it is planned that the students will do a preliminary reading of the script and answer the corresponding questionnaire to identify the objectives, from the point of view of the results of learning to be achieved after the experiment. Afterwards, the teacher does an oral check, using questions, before the experiment, to identify pre-laboratory learning.

Specific objectives:
At the end of the internship, students must be able to:
Knowing how to measure peripheral visual acuity; calculate the peripheral visual acuity values â□□â□□based on the eccentricity and observation distance; relate the results obtained with the distribution of photoreceptors in the retina; have knowledge of the clinical applications of peripheral visual acuity.

Material:
All the material to do the experiment is in the laboratory. Detailed script with the questionnaire and subject notes, available at Atenea

Delivery:
Registre per part del professor o professora de la comprovació de l'aprenentatge autònom de l'estudiant i del treball al laboratori i qüestionari amb els resultats de l'experiment en finalitzar la sessió. Es torna corregit i amb la corresponent retroacció del professor o professora a la sessió següent.

Related competencies :
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one's professional abilities through continuing education.
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: 3h
Laboratory classes: 2h
Self study: 1h

3. LABORATORY. THEORETICAL EYE MODELS. (Content 3)

Description:
Practice that must be done in the computer room, individually, with a duration of 2 hours. In the computer room the simulation part is to be carried out, and as directed independent learning it is planned that the students do a preliminary reading of the script and answer the corresponding quiz to identify the objectives, from the point in view of the learning outcomes to be achieved after the experiment. Afterwards, the teacher does an oral check, using questions, before the experiment, to identify pre-simulation learning.

Specific objectives:
At the end of the internship, students must be able to:
Know how to work correctly with the Excel sheet of eye models; know how to interpret the changes that occur in the optics of the eye when some of its optical properties change (radii, thickness, refractive index...).

Material:
All the programs needed to do the simulation are in the computer room; detailed script with the questionnaire and subject notes, available at Atenea.

Delivery:
Registration by the teacher of the verification of the student's independent learning and work in the computer room and questionnaire with the results of the simulation at the end of the session. It is returned corrected and with the corresponding feedback from the teacher in the following session.

Related competencies :
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.
CG9. Expand and update one’s professional abilities through continuing education.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.

Full-or-part-time: 3h
Self study: 1h
Laboratory classes: 2h

5. LABORATORY. OPTICS OF SPHERICAL AMETROPIA: MYOPIA (Content 4)

Description:
Practice to be done in the laboratory, in pairs, with a duration of 2 hours. In the laboratory, the experimental part must be carried out, and as directed independent learning it is planned that the students will do a preliminary reading of the script and answer the corresponding questionnaire to identify the objectives, from the point of view of the results of learning to be achieved after the experiment. Afterwards, the teacher does an oral check, using questions, before the experiment, to identify pre-laboratory learning.

Specific objectives:
At the end of the internship, students must be able to:
Understand the optics of myopia through simulation in an optical bench; know the differences between axial and refractive myopia, as well as different aspects related to the neutralization of myopia, using a simulated eye model on an optical bench; know how to make the connection between the simulation on the optical bench and the situation in clinical practice.

Material:
All the material to do the experiment is in the laboratory; detailed script with the questionnaire and subject notes, available at Atenea.

Delivery:
Registration by the teacher of the verification of the student's independent learning and the work in the laboratory and questionnaire with the results of the experiment at the end of the session. It is returned corrected and with the corresponding feedback from the teacher in the following session.

Related competencies :
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.
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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one’s professional abilities through continuing education.
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: 3h
Self study: 1h
Laboratory classes: 2h

6. LABORATORY. OPTICS OF SPHERICAL AMETROPIA: HYPERMETROPIA (Content 4)

Description:
Pràctica que s'ha de fer al laboratori, per parelles, amb una durada de 2 hores. Al laboratori s'ha de dur a terme la part experimental, i com a aprenentatge autònom dirigit es planifica que els estudiants i les estudiants facin una lectura prèvia del guió i responguin el qüestionari corresponent per identificar els objectius, des del punt de vista dels resultats d'aprenentatge que s'han d'assolir després de l'experimentació. Posteriorment el professor o professora en fa una comprovació oral, mitjançant preguntes, abans de l'experimentació, per identificar l'aprenentatge prelaboratori.

Specific objectives:
At the end of the internship, students must be able to:
Understand the optics of hypermetropia through simulation in an optical bench; learn the differences between axial and refractive hypermetropia, as well as different aspects related to the neutralization of hypermetropia, using a simulated eye model on an optical bench; know how to make the connection between the simulation on the optical bench and the situation in clinical practice.

Material:
All the material to do the experiment is in the laboratory; detailed script with the questionnaire and notes of the subject, available at Atenea

Delivery:
Registration by the teacher of the verification of the student's independent learning and the work in the laboratory and questionnaire with the results of the experiment at the end of the session. It is returned corrected and with the corresponding feedback from the teacher in the following session.

Related competencies :
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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
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.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one's professional abilities through continuing education.
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: 3h
Laboratory classes: 2h
Self study: 1h

7. LABORATORY. Astigmatism (Content 4)

Description:
Practice to be done in the laboratory, in pairs, with a duration of 2 hours. In the laboratory, the experimental part must be carried out, and as directed independent learning it is planned that the students will do a preliminary reading of the script and answer the corresponding questionnaire to identify the objectives, from the point of view of the results of learning to be achieved after the experiment. Afterwards, the teacher does an oral check, using questions, before the experiment, to identify pre-laboratory learning.

Specific objectives:
At the end of the practice, the students must be able to:
Understand the optics of astigmatism; know the formation of images of various objects for an astigmatic eye, using a simulated eye model on an optical bench; understand ray tracing of an astigmatic eye; understand the neutralization of ocular astigmatism with negative cylinder; knowing how to make the connection between the simulation on an optical bench and the situation in clinical practice.

Material:
All the material for carrying out the experiment is in the laboratory; detailed script with the questionnaire and subject notes, available at Atenea.

Delivery:
Registration by the teacher of the verification of the student's independent learning and the work in the laboratory and questionnaire with the results of the experiment at the end of the session. It is returned corrected and with the corresponding feedback from the teacher in the following session.

Related competencies :
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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one’s professional abilities through continuing education.
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: 1h 30m
Laboratory classes: 1h
Self study: 0h 30m

CONTINUOUS ASSESSMENT TEST 1 (CAT1)

Description:
Individual test in the classroom lasting two hours with exercises on part of the theoretical and practical concepts of the subject (contents 1, 2 and 3).
In this test, the following European diploma skills are assessed:
schematic eye models, eye dioptric, entoptic phenomena, radiation and the eye.

Specific objectives:
At the end of the test, students must be able to demonstrate the achievement of the specific objectives of contents 1, 2 and 3.

Material:
Statements, calculator and form to take the test.

Delivery:
Resolution of the test. It represents 25% of the final grade of the subject.

Related competencies :
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.
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
CG9. Expand and update one’s professional abilities through continuing education.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.

Full-or-part-time: 12h 45m
Practical classes: 2h
Self study: 10h 45m

CONTINUOUS ASSESSMENT TEST 2 (CAT2)

Description:
Prova individual a l'aula de dues hores de durada sobre una part dels conceptes teoricopràctics de l'assignatura (continguts 4, 5 i 6).
En aquesta prova s'avaluen les competències del diploma europeu següents:
models d'ull esquemàtic, diòptrica de l'ull, fenòmens entòptics, qualitat de la imatge retinal, la radiació i l'ull, coneixement teòric bàsic de la mesura de la visió i comprensió dels efectes de l'error refractiu, comprensió de la prescripció refractiva.

Specific objectives:
At the end of the test, students must be able to demonstrate the achievement of the specific objectives of contents 4, 5 and 6.

Material:
Statements, calculator and form to take the test.

Delivery:
Resolució de la prova. Representa el 45 % de la qualificació final de l'assignatura.

Related competencies :
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.
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
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.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one's professional abilities through continuing education.

Full-or-part-time: 28h 30m
Practical classes: 2h
Self study: 26h 30m

PRACTICE TEST (PT)

Description:
Individual test in the classroom lasting one hour on the concepts and practical situations worked on in the laboratory and in the computer room.

Specific objectives:
At the end of the test, students must be able to demonstrate the achievement of the specific objectives of the internship.

Material:
Statements, calculator and form to take the test.

Delivery:
Resolution of the test. It represents 10% of the final grade of the subject.

Related competencies :
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
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.
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
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.
CG9. Expand and update one’s professional abilities through continuing education.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.

Full-or-part-time: 8h 30m
Self study: 7h 30m
Practical classes: 1h

ASSESSMENT OF TRANSVERSAL COMPETENCE

Description:
The evaluation of transversal competence CT04. Team work will be done in the evaluation of the laboratory work and in the evaluation of the classroom exercises (EA).

Full-or-part-time: 1h
Laboratory classes: 1h

Classroom exercises

Description:
Solving exercises in groups and within the same classroom. The exercises are proposed by the teacher without the student having any prior information. To solve them, the student can use all the material at his disposal that he considers appropriate.

Specific objectives:
That the student follows the subject as it develops.

Material:
Tot el material de l'assignatura està penjat a Atenea.

Delivery:
Resolution of the exercises. It represents 10% of the final grade.

Related competencies :
CE12. Understand and make use of techniques for analysing, measuring, correcting and monitoring the effects of compensatory optical systems on the visual system in order to optimise their design and fit. Make use of the techniques of centring, fitting, mounting and adjusting on all kinds of optometrically prescribed lenses, visual aids and protective eyewear. Prescribe, monitor and follow up with optical corrections. Identify and analyse environmental and workplace risk factors that could lead to visual issues.
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.
CE13. Understand the factors that limit retinal image quality. Demonstrate knowledge of the spatial and temporal aspects of vision. Carry out psychophysical tests to determine levels of visual perception. Demonstrate knowledge of the functioning of the retina as a receptor of radiant energy. Demonstrate knowledge of the basic models of vision of colour, shape and movement. Demonstrate knowledge of age-related changes in perceptual processes. Measure and interpret psychophysical data obtained from an assessment of visual perception.
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.
CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.
CG9. Expand and update one's professional abilities through continuing education.
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: 2h
Practical classes: 2h

COMPETENCES EUROPEAN DIPLOMA

Description:
The subject VISUAL OPTICS participates in the competences of the European diploma:
Area A3 Visual Optics nº 1,2,3,and 5 with a weight of 1.5 ECTS
Area A6 Visual Performance nº 1 with a weight of 0.2 ECTS
Area B8 Refraction. Knowledge and Practical nº 1 and 2 with a weight of 4.5 ECTS
Area B 12B: Investigative Techniques. Knowledge and Practical nº2 with a weight of 0.5ECTS

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

Full-or-part-time: 60h
Practical classes: 60h

GRADING SYSTEM

First continuous assessment test (PEC1), 25%; second continuous assessment test (PEC2), 45%; practicals, 20% (practical exam (PAL), 10%; laboratory work, 10%); classroom exercises (EA), 10%.

Students who fail the course with a grade of 3 or higher will have the option of retaking it through a re-assessment exam. This exam will be written with content from the theory part of the course and will be weighted 100%.
This re-assessment will be carried out according to the general conditions established for each course by the Academic Regulations for undergraduate and master's studies at the UPC (NAGRAMA) and the specific conditions established by the Faculty of Optics and Optometry of Terrassa.
Students who pass the re-assessment exam will have a final grade of 5 for the course. Otherwise, the highest grade between the one obtained in the previous evaluation and the one obtained in the re-evaluation will be maintained.

EXAMINATION RULES.

- If any of the laboratory activities are not carried out without justification, 0.25 points will be deducted from the corresponding laboratory work grade (out of 1 point).

In the event of partial or total copying in any of the assessments of the subject, the provisions of the Academic Regulations for undergraduate and master's degrees at the UPC will apply:
"Irregular actions that may lead to a significant change in the grade of one or more students will constitute fraudulent performance of an assessment act. This action will lead to a descriptive grade of fail and a numerical grade of 0 for the assessment act and for the subject, without prejudice to the disciplinary process that may arise as a consequence of the acts carried out.
If the student considers the decision to be incorrect, he or she may make a complaint by means of an application to the director or dean of the teaching centre and, if the response does not satisfy him or her, he or she may lodge an appeal with 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 director or dean of the teaching center will be responsible for resolving objections regarding aspects not included in the regulations.

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Complementary:
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