Course guide
370019 - PERCEPVIS - Visual Perception

Last modified: 30/05/2025

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: Vilaseca Ricart, Meritxell Catedràtica Permanent: (https://futur.upc.edu/MeritxellVilasecaRicart)

Others: Aurora Torrents Gómez, Aurora: Professora Titular: (https://futur.upc.edu/AuroraTorrentsGomez)
Pujol Ramo, Jaume Catedràtic Funcionari: (https://futur.upc.edu/JaumePujolRamo)

PRIOR SKILLS

It is recommended to have completed:
- Visual Optics, Fundamentals of Binocular Vision, Physiology and Biochemistry, Photometry and Optical Instruments, Anatomy of the Visual System.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
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:
CG8. Plan and carry out research projects that contribute to the production of knowledge in the field of optometry and disseminate this scientific knowledge via the typical communication channels.
CG12. (ENG) The ability to understand the general structure of optometry and its connection to other specific disciplines and other complementary ones.

Transversal:
CT3. Teamwork. To be able to work as a member of a multidisciplinary team, either as a base member or undertaking managerial decisions aiming at developing projects from a practical and responsible standpoint, adopting commitments given the available resources

TEACHING METHODOLOGY

The medium group classes will consist of:
MD1 - Participatory expository class of theoretical and practical content.
MD2 - Active methodologies in the classroom (project-based learning (PBL), case studies, role-playing games, cooperative learning, ...)
MD3 - Practical class of resolution, with the participation of the students, of practical cases and/or exercises related to the contents of the subject.
The small group classes will consist of:
MD4 - Laboratory practices
In addition, the student will carry out autonomous work through:
MD5 - Reading of teaching material, texts and articles related to the contents of the subject.
MD6 - Completion of problems, exercises, assignments and resolution of doubts through the Atenea virtual campus.
MD7 - Tutorials.
Material: Students will find support material for ATENEA (presentations, notes, lists of questions and problems, practice scripts, questionnaires, etc.),
as well as the course schedule and assessment activities and bibliography.
ATENEA will be the means of communication used to communicate changes in the course development.
In order to properly monitor the course, it is therefore necessary to consult this platform frequently.
Laboratory practices: For practice sessions, students must read the available script beforehand.
These scripts will be delivered to the teacher once the practice session has finished with the results obtained during the experiment.
Attendance at practical classes is mandatory.
Tasks during independent learning hours.
Students must dedicate the independent learning hours to studying the content,
to individually completing the proposed problems and completing questionnaires available on Atenea (self-learning).

LEARNING OBJECTIVES OF THE SUBJECT

2. Competence in carrying out instrumental tests for the evaluation of visual functions and eye health.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

UNIT 1: INTRODUCTION TO VISUAL PERCEPTION.

Description:
How to study vision? The visual process. The retina and the visual pathways.
The visual stimulus. Filters and eye protection.
Evaluation and reduction of risks of eye damage due to radiation.
Beginnings of the study of Visual Perception.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 5h
Practical classes: 2h
Self study : 3h

UNIT 2: PSYCHOPHYSICAL MEASUREMENT METHODS.

Description:
Threshold measurements. Psychophysical methods for threshold detection.
Signal detection theory. Psychometric function.
Sensitivity and specificity concepts. ROC curves.
Weber's law. Magnitude and sensation.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables

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

UNIT 3: DUAL NATURE OF THE RETINA.

Description:
Operating range of the visual system. Scotopic and photopic vision.
Cones and rods. Scotopic and photopic spectral sensitivity.
Dark adaptation. Light adaptation.
Spatial resolution and spatial summation. Stiles-Crawford effect.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 12h
Practical classes: 5h
Self study : 7h

UNIT 4: COLOR VISION.

Description:
Theories to explain color vision: Trichromatic theory, opponent color theory, and zone theory.
Perceptual attributes of color. The Munsell color appearance system.
Psychophysical color (CIE specification system). Relationship between perceptual attributes and psychophysical magnitudes.
Second-order effects. Chromatic adaptation and color constancy. Perception and measurement of color differences. Clinical applications.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 12h
Practical classes: 5h
Self study : 7h

UNIT 5: COLOR VISION ANOMALIES.

Description:
Classification. Properties of color vision deficiencies.
Color perception in anomalous dichromats and trichromats.
Achromatopsia and chromatopsia.
Basis of color vision tests.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 9h
Practical classes: 4h
Self study : 5h

UNIT 6: SPATIAL VISION.

Description:
Modulation Transfer Function (MTF).
Contrast Sensitivity Function (CSF).
Factors affecting CSF. Clinical measurement of CSF.
Clinical applications of MTF and CSF.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 12h
Practical classes: 5h
Self study : 7h

UNIT 7: TEMPORAL VISION.

Description:
Perception of brief, intermittent stimuli.
Temporal Contrast Sensitivity Function (TCSF).
Factors affecting TCSF.
Clinical applications of TCSF.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 5h
Practical classes: 2h
Self study : 3h

UNIT 8: PERCEPTION OF MOVEMENT.

Description:
Stimuli used to study motion perception.
Dynamic visual acuity.
Saccadic suppression.
Perceptual illusions.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 5h
Practical classes: 2h
Self study : 3h

UNIT 9: THE VISUAL SIGNAL IN THE RETINA.

Description:
Receptive field concept. Receptive fields of retinal neurons. Clinical considerations.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 12h
Practical classes: 5h
Self study : 7h

UNIT 10: VISUAL PATHWAYS.

Description:
The central nervous system. Primary visual pathway.
Parvocellular and magnocellular systems.
Secondary visual pathways. Clinical considerations.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

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

UNIT 11: THE VISUAL SIGNAL IN THE BRAIN.

Description:
Cerebral cortex and brain areas. Striate and circumstriate cortex.
Perception of color, movement, depth and shape.
Clinical considerations: amblyopia and other syndromes.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

Full-or-part-time: 12h
Practical classes: 5h
Self study : 7h

UNIT 12: ELECTROPHYSIOLOGICAL RECORDS.

Description:
Electrooculogram. Electroretinogram. Visual evoked potentials.

Related activities:
Laboratory practices.
Evaluation questionnaires (ATENEA).
Deliverables.

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

ACTIVITIES

LABORATORY SKILLS.

Description:
Practices to be carried out in the laboratory, in groups of 2-3 students, with a duration of 2 hours.
The experimental part will be carried out in the laboratory, and as directed autonomous learning it is planned that the students carry out a prior reading of the script (available at ATENEA).
The practice is carried out in the Computer Room 2, TR8 building, floor -1.
Once the practical session is finished, the completed script with the results obtained and the analysis of these results will be delivered to the teacher for evaluation.
The practical sessions to be carried out will be, among others:
- Measurement of VA using different psychophysical methods.
- Magnitude and sensation. Stevens' Law.
- Absolute and differential luminance threshold.
- Measurement of RGB tristimulus values â□□â□□with a visual colorimeter.
- Color vision test. Bases and application.
- Contrast sensitivity function (chromatic and achromatic).
- Visual phenomena. Color and luminosity. Form, movement and depth.
The practicals are compulsory. The work carried out in the laboratory during the practicals represents 10% of the final grade.

Full-or-part-time: 35h
Self study: 21h
Laboratory classes: 14h

name english

Description:
Individual test lasting two hours.
The test consists of a theoretical part where questions are formulated regarding theoretical concepts of the content taught in class and a practical part,
where several problems and/or questions related to units 1-5 must be solved.
Material: Theory notes and problems available through the ATENEA virtual campus and recommended bibliography.
Statements, calculator and form.
Deliverable: Resolution of the test. It represents 40% of the final grade for the subject.

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

SECOND TEST

Description:
Individual test lasting two hours.
The test consists of a theoretical part where questions are formulated regarding theoretical concepts of the content taught in class and a practical part,
where several problems and/or questions related to units 6-12 must be solved.
Material: Theory notes and problems available through the ATENEA virtual campus and recommended bibliography.
Statements, calculator and form.
Deliverable: Resolution of the test. It represents 30% of the final grade for the subject.

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

PRACTICE TEST.

Description:
Individual test lasting one hour. The test consists of solving questions seen in the practical sessions.
Material: Practice scripts available through the ATENEA virtual campus and recommended bibliography.
Statements, calculator and form.
Deliverable: Test resolution. It represents 10% of the final grade for the subject. The work done in the laboratory during the practical sessions represents another 10% of the final grade.

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

DELIVERABLES.

Description:
Continuous assessment in the form of deliverables: problem and/or question solving, critical reading of an article, questionnaires in Atenea, videos, etc. It represents 10% of the final grade for the subject.

Full-or-part-time: 9h
Self study: 9h

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

The final grade for the subject is obtained from the partial grades obtained in the first test,
the second test, the laboratory grade and the deliverables taking into account the following proportions:

Partial test grade: 35%
Final test grade: 35%
Laboratory grade: 20% (10% practical test + 10% laboratory work)
Continuous assessment activities grade (deliverables): 10%

Transversal competences
CT3: Oral and written communication. The evaluation of this competence must be carried out through the deliverables
(problem and/or question resolution, delivery of practical questions, critical reading of an article, videos, etc.).

Competencies of the European diploma
The subject Visual Perception participates totally or partially in various competences.
The evaluation of these will be carried out through the subject grade.

In order to be eligible for the re-evaluation of the subject, it will be necessary to meet the general conditions established each year by the Academic Regulations for undergraduate and master's studies at the UPC (NAGRAMA) and the specific ones of the FOOT.
Students who pass the re-evaluation exam will have a final grade of 5 for the subject.
Otherwise, the highest grade between the one obtained in the previous evaluation and the one obtained in the re-evaluation will be maintained.

Individual test lasting two hours.
The test consists of a theoretical part in which questions are formulated regarding theoretical concepts of the content given in class and a practical part,
where several problems and/or questions related to units 1-12 must be solved.
Material: Theory notes and problems available through the ATENEA virtual campus and recommended bibliography.
Statements, calculator and form.
Deliverable: Test resolution. It represents 100% of the final grade for the subject.

EXAMINATION RULES.

Attendance at practical classes is compulsory (80% of the practical classes must have been attended in order to be eligible to take the practical test).

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 Degree Studies at the UPC will apply:
Irregular actions that may lead to a significant change in the grade of one or more students constitute fraudulent performance of an assessment act.
This action entails a descriptive grade of fail and a numerical grade of 0 for the assessment act and 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 file a complaint by means of an application with the director or the 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 authorisation of the authors.
It is the responsibility of the director or dean of the teaching center to resolve objections regarding aspects not included in the regulations."

BIBLIOGRAPHY

Basic:
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- Artigas, J.M [et al.]. Óptica fisiológica: psicofísica de la visión. Madrid: McGraw-Hill-Interamericana, cop. 1995. ISBN 8448601157.
- Urtubia Vicario, César. Neurobiología de la visión [on line]. 2ª ed. Barcelona: Edicions UPC, 1999 [Consultation: 24/02/2023]. Available on: http://hdl.handle.net/2099.3/36204. ISBN 8483013568.

Complementary:

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