COURSE DATA

DATA SUBJECT

Code: 47007
Name: Visual ergonomics
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2280 - Master's Degree in Advanced Optometry and Vision Sciences	Facultat de Física	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2280 - Master's Degree in Advanced Optometry and Vision Sciences	Materias Optativas	ELECTIVES

COORDINATION

PONS MORENO ALVARO MAXIMO

SUMMARY

This Visual Ergonomics course examines the principles governing proper interaction between people and their work environment from a visual perspective. It analyzes the foundations of visual ergonomics and the related regulations and eye protection criteria to ensure optimal visual performance across various settings. The effects of radiant energy sources on the eye and the corresponding radiometric control methods are also reviewed, along with the principles of photosensitization. The course then introduces the basics of lighting technology, covering types of lamps and luminaires, lighting design for interiors and exteriors, and light source colorimetry. Psychological factors of lighting and color in creating comfortable and safe environments are explored, as well as workplace eye protection guidelines. Finally, it examines the factors affecting visual performance when using screens, driving, playing sports, or studying, including the prevention and protection mechanisms that should be implemented.

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 that students have a solid knowledge of ocular anatomy and physiology, as well as the basic principles of optics (refraction, image formation). They should be familiar with concepts of photometry and radiometry for the control of light sources, and understand the fundamentals of lighting technology (types of lamps, luminaires, and lighting design). It is also useful to have previous experience in workplace ergonomics or interior space design.

COMPETENCES / LEARNING OUTCOMES

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Act autonomously in learning, make informed decisions in different contexts, issue judgements based on experimentation and analysis and transfer knowledge to new situations.

Be able to communicate effectively, both orally and in writing, adapting to the characteristics of the situation and audience.

Collaborate effectively in work teams, taking on responsibilities and leadership roles and contributing to collective improvement and development.

Contribute to the design, development and implementation of solutions that respond to social demands, considering the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical reasoning in the field of the degree, considering aspects such as professional ethics, moral value and the social implications of the different activities carried out.

Discuss diagnostic judgements and appropriate decision-making in visual health education.

Inform athletes about the importance of visual ergonomics and proper practices to maintain good visual health and optimal performance in their sport.

Know and understand, within the area of the degree, inequalities based on sex and gender in society; integrate different needs and preferences based on sex and gender into the design of solutions and problem-solving.

Propose appropriate conditions for visual ergonomics in both workplace and daily environments.

Propose creative and innovative solutions to complex situations or problems within the field of knowledge to respond to diverse professional and social needs.

Recommend appropriate ergonomic devices and tools to improve comfort and visual health, such as screens, keyboards, chairs and lighting systems.

Recommend appropriate visual ergonomic techniques and strategies to optimise sports performance, including the selection of suitable visual equipment and accessories.

Recommend ergonomic and corrective measures to optimise vision while driving.

Understand photometry aspects across various environments (indoor and/or outdoor) and their relation to the user's visual performance.

Understand regulations related to eye protection and visual performance.

Understand the aspects involved in visual fatigue and performance in activities such as screen use, driving, sports practice and learning.

Understand the functional limits of human vision and their relation to age, whether in the workplace or in leisure activities, in connection with task-related visibility factors.

Understand the interconnection of the three cornerstones of ergonomics (user-task-environment).

DESCRIPTION OF CONTENTS

1- Introduction to Visual Ergonomics. Ocular Effects of Radiant Energy
Introduction to occupational optometry. The mechanisms of interaction between radiation (visible light, ultraviolet, infrared, and laser) and ocular tissues are analyzed, describing thermal, photochemical, and mechanical damage and their clinical implications.

2- Radiometry, Photometry, and Colorimetry of Radiant Energy Sources in the Workplace
This topic covers the techniques and equipment for measuring the radiometric and photometric intensity of radiant energy sources, including verification protocols to ensure exposure levels below safety thresholds. Concepts such as color space, color temperature, color rendering index, and color metrology are introduced, with practical applications for lamp and workplace environment assessment.

3- Principles of Lighting Technology
The fundamentals of lighting technology are explained, covering light quality, spectra, and their influence on perception and visual health. Different lighting systems (incandescent, fluorescent, LED, and mixed systems), their photometric and radiometric characteristics, energy efficiency, and selection criteria for different environments are described. Techniques for lighting design, calculation of illuminance levels, glare control, and light distribution in workplaces and urban areas are explained, ensuring visual comfort and regulatory compliance.

4- Visual Performance at Work
The effects of color and light on mood, space perception, and productivity are studied, integrating principles of environmental psychology to design ergonomic and safe environments.

5- Ergonomic Use of Display Screens and Mobile Devices
Ergonomic and optical variables in the use of display screens and mobile devices are analyzed, addressing device design, postural ergonomics, and strategies to reduce fatigue and improve

visual performance. Issues related to computer vision syndrome are discussed.

6- Ergonomics in Specialized Settings
Vision in driving. Vision and sports. Vision in the educational field.

7- Ocular Prevention and Protection at Work
The main strategies for ocular prevention and protection in the workplace are reviewed, as well as the main national and international standards for ocular safety at work and leisure. Analysis of the visual performance criteria required in different activities (driving, studying, sports) to ensure safe visual environments. Details are given on individual and collective protection measures (safety glasses, screens, filters), their specific regulations according to occupational hazards, and the selection of equipment to minimize harmful exposure.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	20,00
Seminar	10,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	25,00
Preparation of lessons	0,00
Preparation for assessment activities	5,00
Resolution of case studies	0,00
Total hours	**45,00**

TEACHING METHODOLOGY

The course combines lectures and seminars designed to promote both knowledge acquisition and active student participation.

Lectures:
The expository method (lecture-based teaching) is used, supported by audiovisual materials (images, videos, and diagrams) projected in class, facilitating the understanding of concepts and techniques.

Seminars:

The design of ergonomic projects is proposed, where skills are developed through meaningful and collaborative learning.

EVALUATION

The assessment system combines individual tests and seminar assignments (which will be announced at the beginning of the course), with the following components and weightings:

- Part 1: Theoretical or theoretical-practical exam: An in-person assessment that may include essay questions, multiple-choice questions, or case studies related to community visual health. This represents 70% of the final grade.
- Part 2: Seminar assignments: These will be assessed continuously throughout the course and account for 30% of the final grade.

To be able to average and pass the course, students must obtain at least 3.5 out of 10 in each part.

In the event of failing, for the second exam session it will not be necessary to be reassessed in those parts where a score higher than 3.5 was achieved; the average may be calculated using the grade from the first session for those parts. If the seminar assignments part is failed in the first session, the assessment in the second session will be based on an assignment whose topic will be specified when the first session grade is released.

REFERENCES

Basic references:

- Anshel J. (ed.). *Visual Ergonomics Handbook.* CRC Press / Taylor & Francis; 2005. ISBN 978-1566706827.
- American Optometric Association (AOA). *Occupational Vision Manual.* AOA. Disponible en: https://www.sdeyes.org/occupational_vision_manual_par.php
- North R.V. *Work and the Eye.* Butterworth Heinemann (Oxford University Press); 2001. ISBN 978-0750641722.

Complementary references:

- Smith N.A. *Lighting for Occupational Optometry*. H & H Scientific Consultants (HHSC Handbook Series); 1999. ISBN 978-0948237355.

- Carson G., Doshi S., Harvey W. *Eye Essentials: Environmental & Occupational Optometry*. Butterworth-Heinemann; 2008. ISBN 978-0750675529.