Course guide
370043 - ERGON - Visual Ergonomics

Last modified: 04/07/2025

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). (Optional subject).

Academic year: 2025   **ECTS Credits:** 3.0   **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: José Luis Alvarez Muñoz (https://futur.upc.edu/JoseLuisAlvarezMunoz)

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:
CG1. Demonstrate knowledge of, design and apply prevention and maintenance programmes relating to the population's visual health.
CG9. Expand and update one's professional abilities through continuing education.
CG11. Locate new information and interpret it in context.

CG12. (ENG) The ability to understand the general structure of optometry and its connection to other specific disciplines and other complementary ones.

CG16. Participate effectively in both single-discipline and multidisciplinary work groups on projects related to optometry.

Transversal:
CT6. Independent learning. Identify and overcome gaps in one's knowledge by thinking critically and choosing the best approach to extending one's knowledge.
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.
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
CT5. Efficient use of informacion resources. To manage data and technical and scientific information adquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

Basic:
CB2-OPT. (ENG) Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y osean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio
CB3-OPT. (ENG) Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética
CB4-OPT. (ENG) Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado
CB5-OPT. (ENG) Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía

TEACHING METHODOLOGY

MD1 - Participatory expository class of theoretical and practical content.
MD3 - Practical resolution class, with the participation of students, of practical cases and/or exercises related to the contents of the subject.
MD4 - Laboratory practices.
MD5 - Reading didactic material, texts and articles related to the contents of the subject.
MD6 - Realization of problems, exercises, assignments and resolution of doubts through the Atenea virtual campus.

LEARNING OBJECTIVES OF THE SUBJECT

- Understanding the multidisciplinarity of ergonomics.
- Knowing the different aspects that must be studied to carry out a complete ergonomic analysis.
- Understanding the role played by visual aspects in ergonomics.
- Knowing the current national and international regulations in relation to visual ergonomics.
- Knowing the design bases of all types of visual information devices.
- Understanding the physical characteristics and operation of all types of light sources on the market.
- Knowing the parameters and criteria to properly illuminate a specific space, depending on the activity that must be carried out.
- Studying the effects of light radiation on the human body.
- Differentiating and quantifying the different types of glare to which our visual system may be exposed.
- Understanding the importance of mesopic photometry and analyzing different calculation models.
- Learning the bases for calculating a lighting installation (number and distribution of luminaires necessary to illuminate a specific space).
- Knowing the operation and benefits of all types of data display screens existing in the market, as well as the rules and recommendations for their efficient use by people.
- Knowing what negative effects an inappropriate use of PVD has on the human visual system.
- Knowing the different systems of ocular protection, and the levels of protection that they offer to the user.
- Properly interpreting current European regulations on maximum levels of exposure to incoherent and coherent optical radiation.
- Knowing the current regulations in relation to visual ergonomics in driving.
- Knowing the current regulations in relation to visual ergonomics in school activity.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	22,5	30.00
Hours small group	7,5	10.00
Self study	45,0	60.00

Total learning time: 75 h

CONTENTS

T1-INTRODUCTION TO ERGONOMICS

Description:
Definition of ergonomics. Objectives and basic principles of ergonomics. Methodology and data collection. Dimensional relations of the workplace. Thermal environment Acoustic environment Vibrations physical load mental load Organization of work.
Psychological and sociological aspects of ergonomics.

Full-or-part-time: 6h
Practical classes: 1h 30m
Laboratory classes: 1h 30m
Self study : 3h

T2-PERSON-MACHINE INTERFACES

Description:
Elements of a Person-Machine Interface. Types of visual information devices. Other types of information devices. Recommendations for the design of visual information devices. Control/device relationship and type of compatibility.

Full-or-part-time: 3h 30m
Practical classes: 1h 30m
Self study : 2h

T3-LIGHT SOURCES

Description:
Common characteristics of light sources. Incandescent and halogen lamps. Mercury lamps. Tubular and compact fluorescent lamps. Sodium lamps. Xenon lamps and flashes. LEDs

Full-or-part-time: 6h
Practical classes: 2h
Self study : 4h

T4-PHOTOMETRIA MESÒPICA

Description:
Photopic photometry and scotopic photometry. S/P ratio of the lamps. Mesopic photometry models.

Full-or-part-time: 7h 30m
Practical classes: 1h 30m
Laboratory classes: 2h
Self study : 4h

T5-EFFECTS OF LIGHTING ON THE HUMAN ORGANISM

Description:
ANSES report. Spectral weighting curves of thermal effect and photochemical effect. Transmission of electromagnetic radiation in the ocular media according to age. Spectral curve of sensitivity to glare. Phototoxicity of electromagnetic radiation. Alteration of circadian rhythms.

Full-or-part-time: 4h
Practical classes: 1h 30m
Self study : 2h 30m

T6-LIGHTING IN THE WORKPLACE

Description:
Luminaires and light control. Characteristics of the luminaires. Lighting systems. Recommended lighting levels. Taking advantage of natural lighting. Influence of color on lighting.

Full-or-part-time: 10h 30m
Practical classes: 2h 30m
Laboratory classes: 2h
Self study : 6h

T7-CALCULATION OF LIGHTING

Description:
Lumens method. Point to point method.

Full-or-part-time: 5h 30m
Practical classes: 1h 30m
Self study : 4h

T8-Dazzling

Description:
Type of glare. Glare measurement. Recommended glare limits. Luminaire shielding. Blue light glare.

Full-or-part-time: 6h
Practical classes: 2h
Self study : 4h

T9-DATA DISPLAY SCREENS

Description:
PVD definition. TRC screens. LCD and TFT screens. Plasma screens. OLED and AMOLED screens. QLED screens. Large format LED screens. Electronic ink screens.

Full-or-part-time: 6h
Practical classes: 2h
Self study : 4h

T10-WORKING WITH DATA DISPLAY SCREENS

Description:
Definition of worker of a workplace with PVD. Main complaints in working with PVD. Visual abilities involved in working with PVD. Regulations that PVDs must comply with. Bright environment Specific health surveillance protocol.

Full-or-part-time: 9h
Practical classes: 2h
Laboratory classes: 2h
Self study : 5h

T11-EYE PROTECTION IN THE WORKPLACE

Description:
Personal protection programs. Types of eye injuries. Conditions that an eye protector must meet. Types of eye protectors. Problems associated with the use of eye protectors. European legislation on maximum levels of exposure to coherent and incoherent optical radiation.

Full-or-part-time: 4h
Practical classes: 1h
Self study : 3h

T12- VISUAL ERGONOMICS APPLIED TO DRIVING

Description:
Legislation in force on visual abilities required when driving vehicles. Visual abilities and driving performance. Ergonomic aspects of vehicle design. Relevant ergonomic aspects in public roads. night driving

Full-or-part-time: 4h
Practical classes: 2h
Self study : 2h

T13-VISUAL ERGONOMICS APPLIED TO SCHOOL ACTIVITY

Description:
Development of the visual system and learning in children. Classroom lighting. Recommendations on classroom furniture and painting. Inadequate visual stimulation. Ergonomics of postures. Ergonomic advice for children. Technical Guide to Energy Efficiency in Lighting for Teaching Centers.

Full-or-part-time: 3h
Practical classes: 1h 30m
Self study : 1h 30m

ACTIVITIES

PRACTICE P1-MENTAL LOAD

Description:
Measuring the mental load of several visual tasks, applying the dual task method.

Full-or-part-time: 1h 30m
Laboratory classes: 1h 30m

PRACTICE P2-MESOPIC PHOTOMETRY

Description:
Calculation of the S/P quotient of different light sources, to decide which one is more suitable for mesopic levels of luminance. Application of different calculation methods to obtain the mesopic luminance value, based on the knowledge of photopic and scotopic luminances.

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

PRACTICE P3-PHOTOMETRIC CHARACTERIZATION OF TEACHING SPACES

Description:
Photometric characterization of two FOOT teaching spaces. Illuminance measurements will be taken throughout the work area of â□□â□□these two spaces, and it will be checked whether they comply with the regulations in terms of minimum illuminance, uniformity of illuminance and diversity of illuminance .

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

PRACTICE P4-LOSS OF CONTRAST AND ROBUSTNESS OF A PVD

Description:
Analysis of the loss of contrast suffered by a PVD when the ambient illuminance of the space in which it is located increases. Estimation of the robustness of the PVD.

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

PAC1-FIRST CONTINUOUS ASSESSMENT TEST

Description:
Written exam of the first half of the course content, with a weight of 35% on the final grade of the subject.

Full-or-part-time: 1h 30m
Practical classes: 1h 30m

PAC2-SECOND CONTINUOUS ASSESSMENT TEST

Description:
Written examination of the second half of the course contents, with a weight of 35% on the final grade of the subject.

Full-or-part-time: 1h 30m
Practical classes: 1h 30m

DELIVERY OF PRACTICE REPORTS

Description:
Delivery of the reports of the laboratory practices carried out throughout the course, with a weight of 20% on the final grade of the subject.

Full-or-part-time: 7h
Self study: 7h

CLASSROOM EXERCISES

Description:
In some sessions of the theory classes, exercises will be proposed to be solved by the students in the classroom. The work groups will be of 2 or 3 students. These exercises will be collected, and will have a weight of 10% in the final grade of the subject.

Full-or-part-time: 2h
Self study: 2h

GRADING SYSTEM

The final mark of the subject results from the weighted sum of the following partial marks:

FM = 0.35·CAT1 + 0.35·CAT2 + 0.1·CE + 0.2·PR

FM: final mark

CAT1: first continuous assessment test

CAT2: second continuous assessment test

CE: classroom exercises

PR: delivery of practice reports

Students who obtain a final mark of the subject equal to or higher than 3.0, may take a reassessment exam. In this case, the final mark of the subject will result from the weighted sum of the following partial marks:

FM = 0.8·PAT + 0.2·PAP

FM: final mark

TET: theory content assesssment test

PET: practical content assesssment test

In the case of re-evaluation, if the final mark is higher than 5.0, this will be equal to 5.0.

BIBLIOGRAPHY

Basic:

- Dul, Jan; Weerdmeester, Bernard. Ergonomics for beginners: a quick reference guide. 3rd ed. London, etc: Taylor & Francis, 2008. ISBN 9781420077513.
- The SLL code for lighting. [London]: SLL, 2012. ISBN 9781906846213.
- Anshel, Jeffrey. Visual ergonomics handbook. Boca Raton, FL: CRC Press: Taylor & Francis, cop. 2005. ISBN 1566706823.
- North, Rachel V. Trabajo y ojo. Barcelona [etc.]: Masson, DL 1996. ISBN 8445803352.
- Anshel, Jeffrey. Visual ergonomics in the workplace. London: Taylor & Francis, cop. 1998. ISBN 0748406581.
- Chartered Institution of Building Services Engineers. Code for lighting. Oxford: Butterworth-Heinemann, 2002. ISBN 9780750656375.