

# Course guide

## 370020 - ESTADIS - Statistics and Epidemiology

**Last modified:** 21/03/2024

**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:** 2023    **ECTS Credits:** 6.0    **Languages:** Catalan

### LECTURER

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**Coordinating lecturer:** Guisasola Valencia, Laura <https://futur.upc.edu/LauraGuisasolaValencia>

**Others:** Cardona Torradeflot, Genis <https://futur.upc.edu/GenisCardonaTorradeflot>

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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#### Specific:

CE03. (ENG) The ability to show basic knowledge of geometry and mathematical analysis. The ability to apply general statistical methods to optometry and vision sciences.

CE15. (ENG) Adquirir habilitats de treball en equip com unitat en la que s'estructuren de forma uni o multidisciplinària els professionals i demés personal relacionats amb la salut visual.

#### Generical:

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

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.

CG5. Give opinions and produce reports and expert reports when necessary.

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.

CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.

#### Transversal:

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

CT7. Foreign language. Demonstrate knowledge of a foreign language, preferably English, at an oral and written level that is consistent with graduates' future needs.

## TEACHING METHODOLOGY

MD1 - Participatory lecture 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

MD5 - Reading of didactic material, texts and articles related to the contents of the subject

MD6 - Carrying out problems, exercises, assignments and resolution of doubts through the Atenea virtual campus

## LEARNING OBJECTIVES OF THE SUBJECT

1. Recognize the statistical part in the method and the results of scientific work.
2. Assess the adequacy of the statistical techniques used in scientific works, taking into account the objectives of those works.
3. Use computer tools to carry out statistical analysis of sample data: estimation of statistical parameters and hypothesis testing.
4. Use computer tools for the graphical representation of statistical data in accordance with previously defined objectives.
5. Design simple statistical studies.
6. Know the distribution of diseases related to vision in populations and the factors that influence or determine it, and apply the results of these studies to the control of visual health problems.

## STUDY LOAD

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

**Total learning time:** 150 h

## CONTENTS

### 1.-The scientific evidence

#### Description:

- What scientific evidence is?
- Where the scientific evidence is found?
- Books, websites, Google, Wikipedia, articles.
- What type of study / article gives us the most scientific evidence?
- How to cite a book / article correctly. What DOI is ?
- Bibliographic managers.

#### Related competencies :

CE15. (ENG) Adquirir habilitats de treball en equip com unitat en la que s'estructuren de forma uni o multidisciplinària els professionals i demés personal relacionats amb la salut visual.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

**Full-or-part-time:** 4h

Practical classes: 4h



## 2.-Basic descriptive statistics

**Description:**

content english

**Related competencies :**

CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.  
CE03. (ENG) The ability to show basic knowledge of geometry and mathematical analysis. The ability to apply general statistical methods to optometry and vision sciences.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

**Full-or-part-time:** 14h

Practical classes: 10h

Laboratory classes: 4h

## 3.-Basic inferential statistics

**Description:**

content english

**Related competencies :**

CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.  
CE03. (ENG) The ability to show basic knowledge of geometry and mathematical analysis. The ability to apply general statistical methods to optometry and vision sciences.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

**Full-or-part-time:** 10h

Practical classes: 6h 30m

Laboratory classes: 3h 30m

## 4.-Validity and Reliability

**Description:**

content english

**Related competencies :**

CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.  
CE03. (ENG) The ability to show basic knowledge of geometry and mathematical analysis. The ability to apply general statistical methods to optometry and vision sciences.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

**Full-or-part-time:** 2h

Practical classes: 2h



## 5.- Introduction to Epidemiology

**Description:**

content english

**Related competencies :**

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

**Full-or-part-time:** 4h

Practical classes: 4h

## 6.- Cross-sectional epidemiological designs

**Description:**

content english

**Related competencies :**

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

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

**Full-or-part-time:** 12h

Practical classes: 8h

Laboratory classes: 4h



## 7.- Longitudinal or Cohort Epidemiological Designs

**Description:**

content english

**Related competencies :**

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

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

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

**Full-or-part-time:** 8h

Practical classes: 6h

Laboratory classes: 2h

## 8.- Epidemiological designs of Cases and Controls

**Description:**

content english

**Related competencies :**

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

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

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

**Full-or-part-time:** 4h

Practical classes: 2h

Laboratory classes: 2h



### 9.- Updated epidemiological data on vision problems and ocular pathologies

**Description:**

content english

**Related competencies :**

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

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

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

**Full-or-part-time:** 2h

Practical classes: 2h

## ACTIVITIES

### Practice 1 EST : Basic Descriptive Statistics

**Related competencies :**

CE03. (ENG) The ability to show basic knowledge of geometry and mathematical analysis. The ability to apply general statistical methods to optometry and vision sciences.

**Full-or-part-time:** 4h

Laboratory classes: 4h

### Practice 2 EST: Basic Inferential statistics

**Related competencies :**

CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.

CE03. (ENG) The ability to show basic knowledge of geometry and mathematical analysis. The ability to apply general statistical methods to optometry and vision sciences.

**Full-or-part-time:** 3h 30m

Laboratory classes: 3h 30m



### Practice 1 EPI: Questions about vision in official health surveys

#### Related competencies :

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

CE15. (ENG) Adquirir habilitats de treball en equip com unitat en la que s'estructuren de forma uni o multidisciplinar els professionals i demés personal relacionats amb la salut visual.

CT7. Foreign language. Demonstrate knowledge of a foreign language, preferably English, at an oral and written level that is consistent with graduates' future needs.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

**Full-or-part-time:** 2h

Laboratory classes: 2h

### Practice 2 EPI: Search for a scientific article of across sectional or longitudinal epidemiological study of vision.

#### Related competencies :

CE15. (ENG) Adquirir habilitats de treball en equip com unitat en la que s'estructuren de forma uni o multidisciplinar els professionals i demés personal relacionats amb la salut visual.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT7. Foreign language. Demonstrate knowledge of a foreign language, preferably English, at an oral and written level that is consistent with graduates' future needs.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

**Full-or-part-time:** 2h

Laboratory classes: 2h



### Practice 3 EPI: Search for an epidemiological study of vision with cohort design

#### Related competencies :

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

CG11. Locate new information and interpret it in context.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT7. Foreign language. Demonstrate knowledge of a foreign language, preferably English, at an oral and written level that is consistent with graduates' future needs.

**Full-or-part-time:** 2h

Laboratory classes: 2h

### EUROPEAN DIPLOMA COMPETENCIES

#### Related competencies :

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT7. Foreign language. Demonstrate knowledge of a foreign language, preferably English, at an oral and written level that is consistent with graduates' future needs.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

### Statistical part evaluation

#### Related competencies :

CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry. CE03. (ENG) The ability to show basic knowledge of geometry and mathematical analysis. The ability to apply general statistical methods to optometry and vision sciences.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management





### Epidemiological part evaluation

#### Related competencies :

CG4. Critically reflect on the clinical, scientific, ethical and social issues involved in the professional practice of optometry, understand the scientific foundations of optics and optometry and critically evaluate terminology, clinical trials and research methods related to optics and optometry.

CG13. Demonstrate and interpret methods for critical analysis and theory development and apply them to the field of optometry.

CT5. Efficient use of information resources. To manage data and technical and scientific information acquisition, organization, analysis and visualization and to provide a critical appraisal of the results of this management

CT7. Foreign language. Demonstrate knowledge of a foreign language, preferably English, at an oral and written level that is consistent with graduates' future needs.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

## GRADING SYSTEM

The evaluation of the subject is divided into 50% statistics and 50% epidemiology according to the following detail:

- Deliverable 1 statistics 5%
- Deliverable 2 statistics 15%
- Deliverable 3 statistics 15%
- Statistics exam 15%
  
- Deliverable 1 epidemiology 15%
- Deliverable 2 epidemiology 15%
- Epidemiology exam 20%

RE-EVALUATION: The re-evaluation consists of a single exam that is worth 100% of the grade and will contain 50%-50% questions on statistics and epidemiology. In no case can a student who has less than a 3 or a non-presented NP be accepted.

## EXAMINATION RULES.

In the event of a partial or total copy of any of the evaluations of the subject, the provisions of the Academic Regulations for undergraduate and master's degree studies at the UPC will be applied:

"Irregular actions that may lead to a significant variation in the grade of one or more students constitute a fraudulent conduct of an assessment act. This action involves the descriptive and numerical grade of 0 of the assessment act and the subject, without prejudice to the disciplinary process that may arise as a result of the acts performed.

If the student considers the decision to be incorrect, he or she may file a complaint with the principal or the dean of the school and, if the answer is not satisfactory, he or she may lodge an appeal with the principal.

The total or partial reproduction of the academic or research works, or their use for any other purpose, must have the explicit authorization of the authors.

It is the responsibility of the principal or the dean of the school to resolve the allegations on the aspects not included in the regulations. "



## BIBLIOGRAPHY

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### Basic:

- Friedman Lawrence M.; Furberg, Curt; DeMets David L. Fundamentals of clinical trials. 5th ed. Cham: Springer, 2015. ISBN 9783319185385.
- Armstrong, Richard A. "Statistical guidelines for the analysis of data obtained from one or both eyes". Ophthalmic and physiological optics [on line]. [Consultation: 20/02/2023]. Available on: <https://doi.org/10.1111/opo.12009>.
- Prajapati, Bhavna; Dunne, Mark C.M.; Armstrong, Richard A. "Sample size estimation and statistical power analyses". Optometry today. 2010, july.
- Celentano, David D; Szklo, M; Gordis, L. Gordis epidemiología. 6ª ed. Barcelona: Elsevier, 2019. ISBN 9788491135364.

## RESOURCES

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### Hyperlink:

- Equator. Resource
- GAPMINDER. Resource