

370704 - MÈTODES - Research Methods

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| Coordinating unit: | 370 - FOOT - Terrassa School of Optics and Optometry | | |
| Teaching unit: | 731 - OO - Department of Optics and Optometry 749 - MAT - Department of Mathematics | | |
| Academic year: | 2018 | | |
| Degree: | MASTER'S DEGREE IN OPTOMETRY AND VISION SCIENCES (Syllabus 2012). (Teaching unit Compulsory) | | |
| ECTS credits: | 4,5 | Teaching languages: | Catalan, Spanish, English |

Teaching staff

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| Coordinator: | LUISA JESUS QUEVEDO JUNYENT (http://futur.upc.edu/LuisaQuevedoJunyent) |
| Others: | Laura Guisasola Valencia (http://futur.upc.edu/LauraGuisasolaValencia) Elisabeth Pérez Cabré (http://futur.upc.edu/ElisabetPerezCabre) Imma Gálvez Carrillo (http://futur.upc.edu/MariaimmaculadaGalvezCarrillo) |

Degree competences to which the subject contributes

Transversal:

1. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Teaching methodology

The hours of conducted learning consist on, first, lectures (middle group) in which the professor gives a short presentation to introduce the learning objectives related to general concepts. Subsequently, through practical exercises we intend to motivate the student to become actively involved in his or her learning. Material support in the form of detailed teaching plan is used by ATENEA : learning objectives for content , concepts, examples , programming activities assessment and targeted learning and literature. On the other hand , also are to give seminars in which Workshops in teams of 3-4 members, by performing activities related to the specific objectives Learning each course contents . In these sessions we incorporate some generic skills such as teamwork competence. Thus techniques of cooperative learning in the classroom are developed. In general , after each sessions different tasks are proposed in order to work either individually or in groups outside the classroom. Also it has to be considered autonomous learning hours as those devoted to oriented readings , the resolution of the proposed tasks or questionnaires of self-learning content through the virtual campus ATENEA

Learning objectives of the subject

At the end of the course, the student should be able to:

- Identify the different types of knowledge
- Understand the principles on which scientific research is based
- Explain and differentiate between the main types of research studies
- Recognize the characteristics of applied and laboratory research
- Recognize the characteristics of clinical research
- Identify the use of Epidemiology in the field of vision
- To know some of the scientific investigations that are being carried out in the Faculty of Optics and Optometry
- Recognize the different types of epidemiological studies



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Know how to determine and calculate the main descriptive and inferential statistical tests
Find updated information on a topic (state of the art) within the usual means of scientific dissemination
Know how to extract and understand the most relevant information of a scientific article

Study load

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| Total learning time: 108h 06m | Hours large group: | 0h | 0.00% |
| | Hours medium group: | 23h 54m | 22.11% |
| | Hours small group: | 12h 12m | 11.29% |
| | Guided activities: | 0h | 0.00% |
| | Self study: | 72h | 66.60% |

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Content

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| (ENG) -Fundamentals of scientific research | Learning time: 3h Practical classes: 1h Self study : 2h |
| <p>Description: (ENG) In this content we work: the types of knowledge and the definition and characteristics of scientific research.</p> <p>Related activities: (ENG) None</p> | |
| (ENG) -Type of Investigations | Learning time: 3h Practical classes: 1h Self study : 2h |
| <p>Description: (ENG) In this content we work: the characteristics of the various types of research (experimental, correlational and observational).</p> <p>Related activities: (ENG) Identification of various types of research. Presentation of examples from various studies.</p> | |
| (ENG) -Variables: definitio and classification | Learning time: 5h Practical classes: 1h Self study : 4h |
| <p>Description: (ENG) En aquest contingut es treballa: la definició de variable independent, depenent, estranyes i controlades.</p> <p>Related activities: (ENG) Identificació de variables a partir de l'anàlisi de treballs de recerca.</p> | |

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| <p>(ENG) -Validity and reliability</p> | <p>Learning time: 8h Practical classes: 2h Self study : 6h</p> |
| <p>Description: (ENG) In this content we work: the concepts of internal and external validity of an experiment, and the different types of validity and reliability of an instrument of measure</p> <p>Related activities: (ENG) No n'hi ha</p> | |
| <p>(ENG) -Phases of scientific research</p> | <p>Learning time: 10h Laboratory classes: 2h Guided activities: 0h Self study : 8h</p> |
| <p>Description: (ENG) In this content we work the phases of scientific research: search for information, delimitation of the Problem, hypothesis approach, study design, collection and analysis of data, results, discussion and Conclusions.</p> <p>Related activities: (ENG) Outline of a research protocol</p> | |

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| (ENG) -Anàlisi de dades | Learning time: 30h Theory classes: 0h Laboratory classes: 6h Self study : 24h |
| <p>Description:</p> <p>In this content the objective of the subject "to determine and calculate the main descriptive and inferential statistical tests" is worked through the analysis of data, in particular the estimation of parameters and the accomplishment of statistical contrasts by means of the resolution of practical cases with bases of Data from the field of vision sciences with? Help of the Minitab statistical package.</p> <p>The contents that will be treated will be very useful to the students to reach the different specific competences of the Master that concern this subject, and in particular, for the following:</p> <p>"To know the mathematical methods of applied and laboratory research and to apply the statistical methods appropriate to each type of study in the treatment of clinical data"</p> <p>Although due to time constraints, the course will be concentrated in the case of variables with normal distribution and in the linear regression model.</p> <p>This content will require a total dedication of 30 hours, of which 6 hours will be made working problems in the computers classroom and 24 hours will be autonomous learning by students with the same program Minitab, for which the UPC provides individual license, autonomously.</p> <p>Related activities:</p> | |

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The content has two linked activities, each of which will contribute 16% in the final grade of the subject.

In each of them, the student must:

- date a statistical report on the data and the models constructed
- present the corresponding files of the various formats of Minitab with the final database and with the executed procedures, and
- Brief presentation of the conclusions.

The faculty will be available for consultation either by face-to-face tutorials or via Skype and by e-mail.

To do each one of the activities, the student will have

- the data file
- the script of the activity
- a theoretical framework
- a presentation on how to decide on appropriate statistical procedures.

Activity 1: Hypothesis Contrasts for statistical parameters.

The objective is the performance of the statistical analysis of the data studied.

Will the contrasts of? Hypotheses for the media relevant to validate the working hypotheses that proceed.

Specific objectives:

When the student has finished this activity he must have the following skills:

- Determine whether a univariate distribution fits the normal distribution.
- If so, choose the relevant Hypothesis contrast for the mean of a univariate distribution.
- Obtain and interpret confidence intervals for the estimated parameters.
- interpreting the result of the contrast performed and writing its conclusion in terms of the original problem.

Activity 2: Linear regression model for multivariate data

The objective is the construction of a regression model for the multivariate data studied and

It will be necessary to construct a model where the predicted value of one of the variables is estimated in function of the others by means of a linear model.

Specific objectives:

When the student has finished this activity he must have the following skills:

- Select the appropriate regression model and determine the role of the variables.
- Build the model using Minitab statistical software.
- Obtain and interpret confidence intervals for the estimated model parameters and for the predicted values ??of the variable.

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| <p>(ENG) -La investigació aplicada i de laboratori</p> | <p>Learning time: 7h Laboratory classes: 2h Self study : 5h</p> |
| <p>Description: In this content work: introduces students to applied laboratory research. It provides material to know the advantages and limitations of applied research, the complementarity with clinical research. Concepts such as the design of experiments in the laboratory, the construction of models, the performance of numerical simulation tests to evaluate the viability of the experiments, solution of experimental problems, interpretation of results, treatment of uncertainty, comparison and validation of The results, etc. Prior to the face-to-face session, tasks are proposed for the knowledge of the research topics that are carried out in the Department of Optics and Optometry (DOO) of Terrassa.</p> <p>Related activities: The students will present in class the most important conclusions of the searches previously made in group of 2 or 3 students. Searches will be made within the areas proposed by the teacher at the beginning of the course, in order to distinguish the characteristics of applied research versus other types of research, to know the complementary contributions of applied research versus clinical research, or Know some aspects of the research that is done in the DOO.</p> | |
| <p>(ENG) -Introducció a l'epidemiologia</p> | <p>Learning time: 4h Practical classes: 1h Self study : 3h</p> |
| <p>Description: (ENG) In this content we work: the definition of epidemiology and its applicability</p> <p>Related activities: (ENG) Debat</p> | |
| <p>(ENG) -Epidemiologia: dissenys principals</p> | <p>Learning time: 17h Practical classes: 5h Self study : 12h</p> |
| <p>Description: (ENG) In this content we work: the main designs used in epidemiology (cross-sectional, case-control and cohort).</p> <p>Related activities: Group analysis of a scientific article on vision epidemiology. Preparation of an individual report.</p> | |

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| (ENG) -Escriptura científica | Learning time: 3h Theory classes: 0h Self study : 3h |
| Description: In this content we work the main features of scientific writing | |
| (ENG) -Elaboració d'un treball tutoritzat | Learning time: 22h Self study : 22h |
| Description: The student has to write a protocol of scientific research | |

Qualification system

The evaluation will be made by four separate tests:

1. The realization of a protocol of original research in the field of optometry and vision sciences (30%)
2. Report on Statistical analyses (32%)
3. Analysis and Report of a research paper in the field of epidemiology (26%)
4. Design of an experiment in the field of applied optics (12%)

Regulations for carrying out activities

To pass the research protocol is required in order to average with the rest of tasks.

If not carried out any of the proposed activities, it will be considered as not scored.

Subsequent to the delivery of the works, a deadline will be opened for suspended students to have a second chance to review suspended activities and submit them again for reassessment.

Reassessment will be taken according to general rules established in the "Normativa general de Graus i Màsters de la UPC" and to particular rules from the "Facultat d' Òptica i Optometria de Terrassa". It will be a single final exam covering all the subjects of the course.

A final grade of 5 will be awarded to students passing this exam, otherwise the previous grade will remain.

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Bibliography

Basic:

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Kestenbaum, Bryan. Epidemiology and biostatistics: an introduction to clinical research. London; New York: Springer, 2009. ISBN 9780387884325.

Argimón Pallás, José M; Jiménez Villa, J. Métodos de investigación clínica y epidemiológica. 3a ed. Madrid [etc.]: Elsevier, cop. 2004. ISBN 9788481747096.

Gordis, Leon. Epidemiología. 3ª ed. Madrid [etc.]: Elsevier, cop. 2005. ISBN 8481748390.

Kleinbaum, D.G.; Sullivan, K.M.; Barker, N.D. A Pocket guide to epidemiology. [New York]: Springer, cop. 2007. ISBN 9780387459646.

Others resources:

COMPUTERS CLASSROOM