



COURSE DATA

DATA SUBJECT

Code: 43013
Name: Basic methodological principles of biomedical research
Cycle: Master's Degree / Doctorate
ECTS Credits: 15
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2137 - Master's Degree in Biomedical Research	Facultat de Medicina i Odontologia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2137 - Master's Degree in Biomedical Research	Methodology of biomedical research	COMPULSORY

COORDINATION

GONZALEZ TERUEL AURORA M

GUILLEN DOMINGUEZ MARIA LUISA

ORTEGA AZORIN CAROLINA

SUMMARY

This course is made up of 3 blocks:

1. Methods and techniques for electronic access to biomedical and health information. Elaboration of Scientific works.
2. Design of epidemiological studies and data analysis in biomedical research.
3. Ethics and legislation in biomedical research.

This module constitutes the core of general knowledge to be included in the basic \"itinerary\" for master's students.



Lectures will be given by professors from the Departments of Preventive Medicine and Public Health, Food Sciences, Toxicology and Legal Medicine and History of Science and Documentation. It is a basic module in which the students will acquire knowledge on the theoretical basis of the scientific method in biomedicine, the main instruments (repertoires, databases and other automated resources) used for the selective retrieval of information in biomedical research and evaluate publications according to the quality indicators of the journals, as well as knowing the key aspects of the design and elaboration of the different kinds of publications.

This module will allow the student to know the methodological bases of biomedical research, know the instruments of biomedical research, be able to obtain data derived from biomedical research, analyse and interpret them correctly and manage biomedical information to be able to communicate adequately research results.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

-

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

To have the ability of obtaining data derived from the biomedical research, analysed it and interpreted it correctly.

To know how to make a suitable bibliographical and documentary search in order to know the state of the art of the issue.



To know the instruments of the biomedical research.

To know the methodological basis of the biomedical research.

To know the regulatory framework in which the biomedical research is held and the ethical aspects involved.

To manage biomedical information and be able to communicate the results of the research.

DESCRIPTION OF CONTENTS

1.

Methods and techniques for electronic access to biomedical and health information. Elaboration of scientific works. Publications, projects and memories.

1. FROM THE RESEARCH QUESTION TO THE SYSTEMATIC SEARCH

1.1 Looking for the research question for a scientific search

1.2 Systematic approach to the review of scientific literature

1.3 Main databases in health sciences

1.4 Multidisciplinary databases

2. ACCESS, DISSEMINATION AND EVALUATION OF RESEARCH RESULTS WITHIN THE FRAMEWORK OF OPEN SCIENCE

2.1 Open science as an ecosystem in production, access and dissemination of information. Fundamental concepts and regulatory framework

2.2. The scientific journal as a dissemination vehicle within the framework of the open science. open access

2.3 Open Science and research data management

2.4 Evaluation of research results.

2.5 Citizen science. concept and scope

3. WRITING A SCIENTIFIC ARTICLE

3.1 Phases of the scientific writing process

3.2 Use of Generative Artificial Intelligence in the scientific writing process. Main tools

3.3 Types of scientific articles. Structure and rhetoric of the article original scientist

3.4. Incorporation of another's ideas: citation rules

3.5. Ethics of scientific publication and main ethical transgressions in the publication process.

Design of epidemiological studies and data analysis in biomedical research

1. Overview of the subject, general and specific objectives. Epidemiology applications in biomedical research. The research method: Data collection, validity and precision of measurement instruments.

2. Causality. Concept of level of evidence and its different classifications. Types of epidemiological studies and their contribution to the level of evidence.

3.Importance of demography in biomedical research. Main indicators and their application in



2.

Design of epidemiological studies and data analysis in biomedical research

1. Overview of the subject, general and specific objectives. Epidemiology applications in biomedical research. The research method: Data collection, validity and precision of measurement instruments. epidemiological studies.
4. Frequency measurements in epidemiological studies. Interpretation and practical exercises.
5. Importance of sample size in epidemiological studies. Methods of calculation in different scenarios.
6. Cross-sectional studies and ecological studies, design principles, association measures and statistics methods most commonly applied in these studies.
7. Case-control studies. Design, advantages and disadvantages. Association measures and statistical analysis of the data. Interpretation of results.
8. Cohort studies. Design, advantages and disadvantages. Association measures and statistical analysis of the data. Interpretation of results.
9. Experimental studies. Design. Types of experimental studies. Randomization, blinding, etc. Advantages and disadvantages. Association measures and statistical analysis of the data. Interpretation of results.
10. Systematic errors and random errors in epidemiological studies. Detection and strategies for minimization.
11. Data integration. Different types of meta-analysis, fundamentals and practical exercises.
12. Development of a research protocol

3.

Ethics and legislation in biomedical research

1. Introduction to bioethics in biomedical research
2. Ethical and legislative framework of biomedical research
3. Oviedo Convention: Background and current status of the legal frame
4. Declaration of Helsinki, as the main element of ethics in biomedical research
5. Analysis and study of the biomedical research law
6. Clinical research with human beings. The Law on the Rational Use of Medications and the Guide to good practices
7. Responsibility in biomedical research.
8. Analysis of liability issues and their prevention

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	60,00
Computer classroom practice	30,00
Total hours	90,00

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	11,00



Individual or group project	0,00
Independent study and work	56,00
Preparation of lessons	158,50
Preparation for assessment activities	40,50
Resolution of case studies	0,00
Total hours	266,00

TEACHING METHODOLOGY

To carry out the teaching-learning process, different teaching methods will be used, seeking a balance between traditional and innovative methods. In this sense, expository didactic forms will be used for theoretical lectures -master class-, although these sessions will be combined with other more innovative approaches with greater involvement for the student; these will be developed online, through of recommended readings related to the syllabus. For this reason, a theoretical-practical approach to the face-to-face sessions will be preferred, without clearly distinguishing between theory and practice, since at all times, the theoretical exposition may be accompanied by exercises and practical applications. There will be specific practice sessions.

Readings of the bibliography will also be proposed prior to the theoretical-practical classes to stimulate participation in class and collective discussion. To achieve this, prior to the exposition of each topic of the theoretical-practical program, the participation of the students will be proposed on some suggestive questions related to the corresponding theoretical contents, so that the debate will precede the presentation of the topic in a specific lecture.

In the practical sessions, information will be obtained from automated databases for real or fictitious research cases. During the practical sessions, group work will be encouraged, as well as the preparation of written reports and the oral presentation of works in order to contribute to the development of these skills together with the deepening of aspects of the subject. Exercises will also be carried out using different computer support for the statistical analysis of the data.

The tutorials time can be used either individually or collectively. From the theoretical and practical sessions, the use of these tutorials will be encouraged in relation to specific aspects of the program (for example, resolution of doubts about readings or group work that is not carried out in the classroom). For face-to-face tutorials, students must request the tutorial in advance by email. In addition, there will be an electronic tutorial in which you can make as many queries as you want, which will be answered as quickly as possible. The e-mail of the professors is on the website of the Department of History of Science and documentation and will be distributed to the students in the presentation session.

EVALUATION

For the 1st block, the evaluation is continuous. Students must complete and submit practical activities on the indicated dates and must pass the questionnaires that will be carried out at the end of each thematic block and that will contain both theoretical and practical questions. The grade for this module will be the arithmetic mean of the test scores

For modules 2 and 3, the evaluation will be carried out through a written exam. Students must answer short



questions about the theoretical-practical content of the different blocks ; the test will also include a computer part.

The final grade for the course will be obtained by adding the grades obtained by the student in each block or module, it will be balanced, based on the hours taught in each different block:

- Module 1: Methods and techniques for electronic access to biomedical and health information 50% final grade;
- Module 2: Design of epidemiological studies and data analysis in biomedical research 25% and
- Module 3: Ethics and legislation in biomedical research 25%.

In order for the grades to be added, students must have obtained a minimum score of 4 points in each of the modules. The minimum mark to pass the exam will be 5 points out of 10.

Finally, a minimum of 80% assistance to lectures is compulsory.

REFERENCES

- BLOQUE 1 Abadal, Ernest. Acceso abierto a la ciencia. Editorial UOC, 2013. <https://core.ac.uk/download/pdf/11889005.pdf> Benos DJ, Fabres J, Farmer J, Gutierrez JP, Hennessy K, Kosek D, et al. Ethics and scientific publication. *Adv Physiol Educ.* 2005;5974. Cargill, M., & O Connor, P. (2013). *Writing scientific research articles* (2nd ed). Oxford: Wiley-Blackwell. (e-book BibliotecUV) Day, R. A. y Gastel, B. (2008). *Cómo escribir y publicar trabajos científicos* (4ª ed). Washington: Pan American Health Organization. (Biblioteca UV) (Octava edición en inglés) Gastel, Barbara, and Robert A. Day. *How to write and publish a scientific paper.* ABC-CLIO, 2016. Grant, Maria J., and Andrew Booth. "A typology of reviews: an analysis of 14 review types and associated methodologies." *Health Information & Libraries Journal* 26.2 (2009): 91-108. Goris, Guirao, and Silamani J. Adolf. "Utilidad y tipos de revisión de literatura." *Ene* 9.2 (2015): 0-0. <http://dx.doi.org/10.4321/S1988-348X2015000200002> ICJME. *Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals.* <http://www.icmje.org/icmje-recommendations.pdf> Hengl, Tomislav, and Michael Gould. "Rules of thumb for writing research articles." *Enschede*, September (2002). Mabrouki, K. y Bosch, F. (Eds.). (2007). *Publicación científica en biomedicina: lo que hay que saber.* Barcelona: Fundación Antonio Esteve. (Biblioteca UV)
- - Moneo C. Moneo, C. (2023). *Estrategia Nacional de Ciencia Abierta (ENCA). 2023-2027.* https://digital.csic.es/bitstream/10261/335248/1/UIMPCuenca_2023_ENCA_Moneo.pdf - Borrull, A. L., i de Ferrer, L. M. A., & Abadal, E. (2023). ¿Es el momento de la ciencia abierta?. *Anuario ThinkEPI*, 17(1), 20. - LEY DE LA CIENCIA, LA TECNOLOGIA Y LA INNOVACION Ley Orgánica 17/2022, de 5 de septiembre. <https://www.boe.es/buscar/act.php?id=BOE-A-2022-14581> - LOSU LEY ORGANICA DEL SISTEMA UNIVERSITARIO . Ley Orgánica 2/2023, de 22 de marzo. https://www.boe.es/diario_boe/txt.php?id=BOE-A-2023-7500 - Biblioteca Complutense de Madrid. (2024). *Ciencia abierta.* Recuperado de [https://biblioteca.ucm.es/cienciaabierta\[5\]](https://biblioteca.ucm.es/cienciaabierta[5])



- BLOQUE 2: -De Irala J, Martínez-González MA, Seguí-Gómez M. Epidemiología aplicada. Barcelona: Ariel, 2004. -Hernández-Avila M. Epidemiología. Diseño y análisis de estudios. Buenos Aires: Panamericana, 2007. -Rothman KJ. Epidemiology. An introduction. Oxford: Oxford University Press, 2002. -Ahlbom A, Novell S. Fundamentos de epidemiología (tercera edición corregida). Colección salud y sociedad. Madrid : Siglo XXI, 1992.- Argimón JM, Jiménez J, Ed. Métodos de investigación clínica y epidemiológica. Barcelona. Harcourt 2004. -Hernández-Aguado I, Gil de Miguel A, Delgado-Rodríguez M, Boluvar-Montrull F. Manual de epidemiología y salud pública para licenciaturas y diplomaturas en ciencias de la salud. 2.ed.Madrid: Medica Panamericana, 2011 -Gordis L. Epidemiología. 3ed. Elsevier.2005.
- BLOQUE 3: -Código Internacional de Ética Médica. <http://www.wma.net/s/policy/c8.htm> - Declaración de Tokio. <http://www.wma.net/s/policy/c18.htm> -Manual de Ética Médica de la Asociación Médica Mundial. <http://www.wma.net/s/ethicsunit/resources.htm> -Declaración de Helsinki. <http://www.wma.net/s/policy/b3.htm> -Convenio de Oviedo. www.eutanasia.es/leyes/Oviedo1997.pdf -Ley de Investigación Biomédica. www.boe.es/boe/dias/2007/07/04/pdfs/A28826-28848.pdf -Ley sobre el uso racional de medicamentos y productos sanitarios. www.boe.es/boe/dias/2006/07/27/pdfs/A28122-28165.pdf