COURSE DATA

DATA SUBJECT

Code: 43018
Name: Fundamentals of research in clinical medicine
Cycle: Master's Degree
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	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2137 - Master's Degree in Biomedical Research	Fundamentals of clinical research in biomedicine	ELECTIVES

COORDINATION

MARTINEZ HERVAS SERGIO

SUMMARY

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

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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 to apply the foundations of the scientific methodology to the clinic investigation in human beings.

To have the ability to design, perform and analyse clinical protocols and essays.

To have the ability to integrate and to teamwork within a group of consolidated biomedical research.

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

DESCRIPTION OF CONTENTS

1. General aspects of clinical research

1.1. Research in clinical medicine
1.2. The clinical research laboratory in the units of university hospitals.
1.3. Choice of a clinical research question. Hypothesis and objectives.
1.4. The sample size. Sample selection. Homogeneous groups. Inclusion and exclusion criteria.
1.5. Clinical variables. Variable types. Observation or measurement of the results in both groups. Accuracy and precision concept. Systematic and main causes of error.
1.6. The research work. How to write it and main errors.
1.7. Critical analysis of works in clinical research.

2.1. Medicine Area
-Research in Cardiology
-Research in Endocrinology and Nutrition
-Research in Immunology and Allergy
-Research in Internal Medicine
-Research in Nephrology
-Research in Pneumology
-Research in Oncology

- Research methodology and main lines of research in the different clinical areas.
- Clinical applicability of research in each clinical area: translational research

2. Research in medicine and medical specialties

2.1. Medicine Area
-Research in Cardiology
-Research in Endocrinology and Nutrition
-Research in Immunology and Allergy
-Research in Internal Medicine
-Research in Nephrology- Clinical trials in each clinical area

2.2. Psychiatry and Clinical Psychology Area
- Introduction to Psychiatry
- Basic and clinical research

23. Dermatology Area
- Research methodology in dermatology and main lines of research

2.4. Radiology Area
- Clinical studies in radiology: comparison-validation of diagnostic techniques, evaluation of treatments carried out by interventional radiology.
- Application of artificial intelligence in Radiology: lung nodule and breast cancer screening.
- Imaging biomarkers.

3. CIPF. Diagnoses and treatment of rare diseases

Discovery of new genes associated with Mendelian diseases. Genealogy Workshop. Models and therapies for the study of hereditary retinal dystrophies.

4. CIPF.Bioinformatics

Introduction to transcriptomics and high-throughput technologies. Exploration and pre-processing of gene expression data. Differential expression analysis. Functional enrichment.

5. CIPF. Biostatistics.

Introduction to free software R and Rstudio. Univariate and multivariate descriptive statistics. Basic concepts of statistical inference. Parametric and non-parametric hypothesis tests. Analysis of variance. Regression models: linear and generalized linear.

6. CIPF. Cancer biology

Introduction to cancer: What is cancer. cancer properties. Cancer genetics: Oncogenes and tumor suppressors. Growth factors, receptors and cancer. Oncogenic signaling. Tumor stem cells or cancer stem cells (CSC). Cancer and placentation. Tumor and Stroma.

7. CIPF.Neuropsychiatric pathologies: hepatic encephalopathy and schizophrenia

Hepatic encephalopathy. animal models. Neuroinflammation and alterations in neurotransmission. therapeutic implications. Ex vivo and in vivo study. behavioral studies. Analysis of neurotransmission by cerebral microdialysis in vivo. Molecular psychiatry: pathophysiology of cortical circuits. The cortex, the most complex region of the brain. Pathologies of the neurological development of cortical circuits. What happens if something goes wrong?
The golden age of neurobiology: new tools to investigate cortical circuits.

8. CIPF. Cellular therapy

Pluripotent stem cells: fundamentals and types. iPS cells as a tool to study diseases. Cell Therapy in pathologies of the nervous system.

9. CIPF. Drugs and biomarkers

Nanomedicine in research and medical practice.
Cell models for biomedical research.
Animal experimentation models in drug development.
Intercellular communication by exosomes and their use as biomarkers.
Gut microbiota as functional food and biomarker of metabolic disease.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	45,00
Other activities	45,00
Total hours	**90,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	55,00
Independent study and work	90,00
Preparation of lessons	55,00
Preparation for assessment activities	0,00
Resolution of case studies	20,00
Total hours	**220,00**

TEACHING METHODOLOGY

This course (Master) uses as teaching methodology the training:

A) Online teaching.
Research papers, bibliography.

B) Lectures.

A total of 15 sessions of 3 hours will be held at the Faculty of Medicine:

- 4 research sessions in clinical medicine.
- 1 research session in Cardiology
- 1 research session in Dermatology
- 1 research session in Endocrinology and Nutrition
- 1 research session in Immunology and Allergy
- 1 research session in Internal Medicine
- 1 research session in Nephrology
- 1 research session in Radiology

And 45 hours of classes from the month of March at the Principa Felipe Research Center.

C) Group and individual work.

EVALUATION

MEDICINE SESSIONS (50% GLOBAL MARK):

Participation and presentation in face-to-face sessions 50%
Final work individually (research project) 50%

CIPF SESSIONS (50% GLOBAL MARK):

Resolution of two questions chosen from a battery of practical questions.

REFERENCES

- -Hulley SB, Cummings SR. Diseño de la investigacióin clínica. Barcelona, Doyma, 1993 -Laporte

JR. Principios básicos de investigación clínica. ISBN 84-86754-22-4. Madrid, Ediciones Argo 1993. -Argimon Payas JM, Jimenez Villa J. Métodos de investigación. ISBN 84-7592-387-9. Barcelona, Doyma, 1991. -Hulley SB, Cummings SR. Diseño de la investigación clínica. ISBN 84-7592-549-9. Barcelona, Doyma, 1993. -Sergi M, Hawkins C. Investigación médica. Barcelona, Medicine, 1990. -Eco U. Como se hace una tesis: técnicas y procedimientos de estudio, investigación y escritura (6ª ed.). ISBN 9788474328967. Barcelona, Gedisa, 1989. -Beidas RS, Koerner K, Weingardt KR, Kendall PC. Training Research: Practical Recommendations for Maximun Impact. AdmPolicyMentHealth. 2011 July; 38(4):223-23 -Gourevitch MN, Jay MR, Goldfrank LR, Mendelsohn AL, Dreyer BP, Foltin GL, et al. Training Physician Investigators in Medicine and Public Health Research. Am J Public Health. 2012; 102(7):e39-e45 -O'Cathain A, Nicholl J, Murphy E. Structural issues affecting mixed methods studies in health research qualitative study. BMC Med Res Methodol. 2009; 9: 82. Published online 2009 December 9 doi: 10.1186/1471-2288-9-82 -Knight KL. Study/Experimental/Research Design: Much More Than Statistics. J Athl Train. 2010; 45(1): 98-100.

- CIPF: -Strachan T, Read A. Human Molecular Genetics 3. Garland Publishing, 2004. ISBN-13: 978-0-81534182-6. ISBN-10. 0-81534182-2. -Weinberg RA. The biology of cancer. New York: Garland Science, Taylor & Francis Group, 2014. ISBN-13: 978-0815342205. ISBN-10: 0815342209. -Benítez-Páez A, Hess AL, Krautbauer S, Liebisch G, Christensen L, Hjorth MF, Larsen TM, Sanz Y; MyNewGut consortium. Sex, Food, and the Gut Microbiota: Disparate Response to Caloric Restriction Diet with Fiber Supplementation in Women and Men. Mol Nutr Food Res. 2021 Apr;65 (8):e2000996. -Cabrera-Pastor A, Llansola M, Montoliu C, Malaguarnera M, Balzano T, Taoro-Gonzalez L, García-García R, Mangas-Losada A, Izquierdo-Altarejos P; Arenas YM, Leone P, Felipo V. (2019) Peripheral inflammation induces neuroinflammation that alters neurotransmission and cognitive and motor function in hepatic encephalopathy: Underlying mechanisms and therapeutic implications. Acta Physiologica (Oxf) :e13270 -Botto C, Rucli M, Tekinsoy MD, Pulman J, Sahel JA, Dalkara D. Early and late stage gene therapy interventions for inherited retinal degenerations. Prog Retin Eye Res. 2022; 86:100975. -Patrick, G. (2017). An introduction to medicinal chemistry (6th ed.). Oxford University Press. ISBN 9780198749691. -Ciferri MC et al. Extracellular Vesicles as Biomarkers and Therapeutic Tools: From Pre-Clinical to Clinical Applications. Biology (2021)