Guia docent

Subject

Assignatura / Grup	11256 - Research Techniques in the Laboratory / 1
Titulació	Master's in Nutrigenomics and Personalised Nutrition
Crèdits	6
Període d'impartició	2nd semester
Idioma d'impartició	Spanish

Professors

Professor/a	Horari d'atenció als alumnes					
	Hora d'inici	Hora de fi	Dia	Data d'inici	Data de fi	Despatx / Edifici
Catalina Amadora Pomar Oliver c.pomar@uib.es	Cal concertar cita prèvia amb el/la professor/a per a fer una tutoria					
Barbara Reynes Miralles barbara.reynes@uib.es	Cal concertar cita prèvia amb el/la professor/a per a fer una tutoria					
Juana Sánchez Roig joana.sanchez@uib.es	Cal concertar cita prèvia amb el/la professor/a per a fer una tutoria					

Context

Within the context of the Official Master in Nutrigenomics and Personalised Nutrition of the UIB, this subject, obligatory in the Module 2A (Research) and of 6 ECTS credits, seeks to introduce students to the research lab and appreciate the experimental designs and methodologies used in scientific research. It includes practical classes. The formation attained will provide the students the knowledge to manage other subjects of the Master, in particular the Research Practicum and the Final Master Project.

Learning outcomes:

* Establish a correct use of good labor standards and laboratory safety guides, and the application of quality control methods and reliable criteria of the analytical results.
* Define and select appropriate experimental models for nutritional studies at molecular, cellular and physiological levels, critical analyzing the advantages and disadvantages between them.
* Define and select the techniques and protocols for collection, preparation and storage of biological samples for analysis in a nutritional study.
* Define and select the main instrumental and bioanalytical techniques for nutritional studies.
* Apply actual knowledge of the main instrumental and bioanalytical techniques in a nutritional study.
* Calculate, interpret and integrate the results of the different bioanalytical and methodological techniques.

Lectures:

* Prof. Dr. Francisca Barceló Mairata (PhD in Biochemistry from the University of Barcelona, 1979) is a member of the UIB research Group of Clinical and Translational Research. Her teaching experience is focused on membrane biochemistry, bioenergetics and instrumental techniques in Biology. Part of her research experience has been focusing on the study of membrane structure and molecular interactions, and cell signaling.
* Dra. Juana Sánchez is associate professor (tenured) at Departamento de Biología Fundamental y Ciencias de la Salud, UIB. Author of more than 60 research articles, 2 international reviews, 3 book chapters, 3 patents and more than 200 contributions to national and international conferences. H-index: 24. She is co-principal

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investigator of a competitive national research project from ISCIII. She has participated in 6 European and 15 national/autonomic research projects, and in 9 R+D private contracts. Research Keywords: Perinatal nutrition, metabolic programing, early biomarkers.

* Dr. Bàrbara Reynés is a PHD from the University of the Balearic Island, and Postdoc researcher in Centro de investigación biomédica en red Fsiopatología de la Obesidad y Nutrición. She is member of the Laboratory of Molecular Biology, Nutrition and Biotechnology, direted by Prof. A. Palou. She is as active researcher; at present her research is focused in the study of a fraction of blood cells as a good source of biomarkers of the development of obesity, metabolic recovery and process of browning.

Requirements

Recomanables

There are no official requirements other than those needed to access the Master studies. However a medium level in Instrumental and Bioanalytical Techniques and English is highly recomennded, especially those students who come from undergraduate related to Nutrition and Food Technology.

Skills

Específiques

* E10 – Knowing the last advances in the field of Nutrigenomics, Personalised Nutrition and Molecular Nutrition and acquiring the abilities necessary for being in constant actualization
* E9 – Apply specific laboratory techniques related to the field of molecular nutrition and nutrigenomics

Genèriques

* G10 – Capacity to articulate the knowledge in oral and written presentations
* G4 – Capacity to formulate hypotheses and to design suitable studies for their verification
* G6 – Capacity for working in an interdisciplinary way
* G9 – Ability to collect, organize and critically analyze the research and professional literature in the discipline
* G8 – Ability to assess and participate in teamwork
* CB8 – Ability to integrate knowledge and handle complex case scenarios, and formulate judgments based on information that was incomplete or limited info, including reflecting on social and ethical consequences and/or responsibilities linked to the application of their knowledge and judgments
* CB10 – Ability of using learning aids and resoueces to undertake self directed learning
* CB7 – The students should be able to apply their knowledge and their ability to solve problems in a new or unfamiliar environment within broader (or multidisciplinary) contexts related to their field of study

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Bàsiques

* Podeu consultar les competències bàsiques que l'estudiant ha d'haver assolit en acabar el màster a l'adreça següent: http://estudis.uib.cat/master/comp_basiques/

Content

Continguts temàtics

Block I. Introduction
* Nutrition and its study. How to approach and design a study on molecular aspects of nutrition. Levels of research.
* Safety and risks in the laboratory. Safety rules. Chemical products. Labeling and storage. Biological, chemical and radioactive hazard.

Block II. Experimental models
* In vivo models. Studies in humans and animals, applications and bioethical aspects. Transgenic animals. Diets, caloric intake. Indirect calorimetry and other functional analysis.
* In vitro models. Applications, advantages and limitations of the techniques. Tissue bath. Tissue culture, types. Biology of cultured cells. Characterization and preservation of cell lines.

Block III. Instrumental techniques in Biochemistry and Biology
* Sample preparation: Collection and storage of samples. Techniques for cell and tissue homogenization. Homogenization buffers, chelating agents, detergents and specific inhibitors.
* Separation techniques: Sedimentation, chromatography and electrophoresis. Theoretical concepts and applications.
* The analytical methodology: Basic principles and errors in biochemical analytical methods. Selecting the method of analysis. Presentation of results.
* Analytical Techniques: Spectrophotometry and fluorimetry: theoretical concepts and applications. Radiochemical techniques. Background and safety notions, applications.
* Methods for determination and identification of biomolecules and bioelements: Carbohydrates, lipids, proteins, nucleic acids, secondary metabolites and bioelements.

Block IV. Molecular and cellular biology techniques
* Molecular biology techniques for nucleic acids studies: Nucleic acid hybridization. Production of probes and applications. Nucleic acid cloning and amplification. Nucleic acid sequencing. Study of polymorphisms. Study of regulatory sequences.
* Molecular biology techniques for protein analyses. Microsequencing. Fusion proteins. Identification of functional domains. Immunological techniques: production of antibodies and applications. Proteomics.
* Cell biology techniques. Light and electron microscopy: fundamentals and applications. In situ hybridization and immunohistochemistry. Physical methods for cell separation. Cryoprotection. Study of cell growth and development. Cell transfection.

Teaching methodology

Activitats de treball presencial (1.6 crèdits, 40 hores)

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Modalitat	Nom	Tip. agr.	Descripció	Hores
Theory classes	Lessons	Large group (G)	Lessons in the classroom, with the explanation of the lecturer in an interactive way with the students. The objective is to know and understand basic and advanced concepts in research techniques in the Laboratory.	12
Seminars and workshops	Activity 2: Students'oral presentations	Medium group (M)	The work prepared by the students, must be defended by oral presentation accompanied with a slide presentation. For the oral defence, the students will have a maximum of 30 minand, afterwards, the students must answer specific questions set by the lecturer or their classmatters. The oral defence must be done the day set for it on the subject timetable.	6
Laboratory classes	Laboratory sessions	Medium group (M)	Sessions in the laboratory under the supervision of the professor. The objective is to introduce students to the laboratory work and put in practice the theory concepts and skills learnt in the subject.	20
ECTS tutorials	Tutorials	Small group (P)	To help students with the establishment of groups for the preparation of an experimental designs and protocols (activity 1). The objective is to follow students'progress and supervise the assessment works.	2

A començament del semestre hi haurà a disposició dels estudiants el cronograma de l'assignatura a través de la plataforma UIBdigital. Aquest cronograma inclourà almenys les dates en què es faran les proves d'avaluació contínua i les dates de lliurament dels treballs. A més, el professor o la professora informarà els estudiants si el pla de treball de l'assignatura es durà a terme a través del cronograma o per una altra via, inclosa la plataforma Aula digital.

Activitats de treball no presencial (4.4 crèdits, 110 hores)

Modalitat	Nom	Descripció	Hores
Individual self-study	Study of the theory contents and lesson exercises	The students are advised to study the slides of the lessons and to consult the recommended bibliography. The student have to take a test (exam) day set for it on thesubject timetable. The objective is to know and understand basic and advanced concepts in research techniques in the Laboratory and consolidate the contents given in the lessons.	50
Group self-study	Activity 1	Preparation of an experimental designs and protocols related to molecular nutrition under professor request. The written report must be delivered the day set for it on the subject timetable or the day set for exam in June or July (extraordinary). The objective is to put in practice the theory concepts learnt in the subject by the interpretation of specific scientific bibliography.	60

Riscs específics i mesures de protecció

The risks the students of the subject may be exposed to are many, since the subject must be developed, in part, in a research laboratory. Including disease risks (by chemicals, physical agents and biological agents), security risks and ergonomic risks. Due to the existence of these risks, it is necessary to follow specific healthy

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and safety rules and guidelines, which will be explained by the professors at the beginning of the laboratory sessions in accordance with RD 1791/2010, which approves the Statute of the college student.
In the same way, depending on the risks, the professors will show the personal protective equipment (PPE) and other necessary protective items and monitors their use. The professors will also explain how to properly manage the waste generated in the laboratory and how to discard it in appropriate containers, according to the safety lab instructions. The security information required will be delivered printed or will be available in the database of the laboratory.

Student learning assessment

Frau en elements d'avaluació

D'acord amb l'article 33 del Reglament acadèmic, "amb independència del procediment disciplinari que es pugui seguir contra l'estudiant infractor, la realització demostradorament fraudulenta d'algun dels elements d'avaluació inclosos en guies docents de les assignatures comportarà, a criteri del professor, una menysvaloració en la seva qualificació que pot suposar la qualificació de «suspens 0» a l'avaluació anual de l'assignatura".

Activity 2: Students'oral presentations

Modalitat	Seminars and workshops
Tècnica	Oral tests **(non-recoverable)**
Descripció	The work prepared by the students, must be defended by oral presentation accompanied with a slide presentation. For the oral defence, the students will have a maximum of 30 minand, afterwards, the students must answer specific questions set by the lecturer or their classmatters. The oral defence must be done the day set for it on the subject timetable.
Criteris d'avaluació	Quality of the slide presentation and its oral defence, taking into account the contents, structure and the correct use of the bibliography, as well as the capacity to adapt to the established time for the oral presentation and answer to specific questions asked by the lecturer. As well as, fit the length oral presentation to the established time.

Percentatge de la qualificació final: 20% amb qualificació mínima 5

Laboratory sessions

Modalitat	Laboratory classes
Tècnica	Attitude scales **(non-recoverable)**
Descripció	Sessions in the laboratory under the supervision of the professor. The objective is to introduce students to the laboratory work and put in practice the theory concepts and skills learnt in the subject.
Criteris d'avaluació	Two items: a) Completing the time screduled in the laboratory (30%) and b) the attitude, interest and capacities for the work performed (70%).

Percentatge de la qualificació final: 20%

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Study of the theory contents and lesson exercises

Modalitat	Individual self-study
Tècnica	Short-answer tests **(recoverable)**
Descripció	The students are advised to study the slides of the lessons and to consult the recommended bibliography. The student have to take a test (exam) day set for it on thesubject timetable. The objective is to know and understand basic and advanced concepts in research techniques in the Laboratory and consolidate the contents given in the lessons.
Criteris d'avaluació	Quality and accuracy of the answers to the questions.

Percentatge de la qualificació final: 40% amb qualificació mínima 4

Activity 1

Modalitat	Group self-study
Tècnica	Papers and projects **(recoverable)**
Descripció	Preparation of an experimental designs and protocols related to molecular nutrition under professor request. The written report must be delivered the day set for it on the subject timetable or the day set for exam in June or July (extraordinary). The objective is to put in practice the theory concepts learnt in the subject by the interpretation of specific scientific bibliography.
Criteris d'avaluació	Quality of the written report delivered, taking into account the contents, structure and the correct use of the bibliography.

Percentatge de la qualificació final: 20%

Resources, bibliography and additional documentation

Learning resources:

* PowerPoint presentations in lectures.
* Use of Moodle environment to transmit content and materials and as an interactive communication tool.
* Bibliographic materials (books, scientific articles, databases, etc.).

Bibliografia bàsica

1 BARCELÓ MAIRATA. Técnicas Instrumentales en Bioquímica y Biología. Universitat de les Illes Balears, Palma, 2003.
2 FRESHNEY. Culture of animal cells a manual of basic technique. 4ª edición. Wiley-liss Inc. New York, 2000.
3 MIESFIELD. Applied Molecular Genetics. John & Sons Inc. New York, 1999.
4 LODISH, BERK, ZIPURSKY, MATSUDAIRA, BALTIMORE. DARNELL. Biología Celular y Molecular. 4ª edición. Editorial Médica Panamericana. Madrid, 2002.
5 WATSON, BAKER, BELL, GANN, LEVINE, LOSICK. Molecular Biology of the Gene. 5ª edición. Benjamin-Cummings. San Francisco, 2004.
6 WILSON, WALKER. Principles and techniques of practical biochemistry. 5ªedición. Cambridge University Press. Cambridge, 2000.

Bibliografia complementària

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Articles in scientific journals indexed by ISI

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