Universitat de les Illes Balears

Teaching guide

Academic year	2016-17
Subject	11256 - Research Techniques in the Laboratory
Group	Group 1, 2S
Teaching guide	A
Language	English

Subject identification

Subject	11256 - Research Techniques in the Laboratory
Credits	1.6 de presencials (40 hours) 4.4 de no presencials (110 hours) 6 de totals (150 hours).
Group	Group 1, 2S (Campus Extens)
Teaching period	Second semester
Teaching language	Spanish

Professors

Lecturers	**Horari d'atenció als alumnes**					
	Starting time	**Finishing time**	**Day**	**Start date**	**Finish date**	**Office**
Francisca Mª de Lluch Barceló Mairata francisca.barcelo@uib.es	14:30	15:30	Tuesday	14/09/2016	14/02/2017	Número 13
Joan Ribot Riutort joan.ribot@uib.es	12:00	14:00	Friday	01/09/2016	17/07/2017	Despacho Q-31 (Edificio Mateu Orfila) - Room Q-31 (Building Mateu Orfila)
Ana María Rodríguez Guerrero amrodriguez@uib.es	15:30	16:30	Monday	01/09/2016	30/06/2017	Q.11 (Mateu Orfila)

Contextualisation

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:

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* 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.
* Dr. Joan Ribot is a PhD in Biochemistry, specialist in Clínical Biochemistry and associate professor of the University of the Balearic Islands; with 3 six-year research expertise stretches recognized by the Spanish Government and eighteen years of teaching experience at the University. He is also an active researcher; at present, his research is focused in the field of gene-nutrient interactions and the relationship of nutrients and early nutritional interventions with the prevention of metabolic disorders associated to energy control, obesity and associated disorders, including atherosclerosis and Cancer. He has participated in numerous international cooperative research projects.
* Dr. Ana M. Rodríguez is PhD in Biochemistry and associate professor of the University of the Balearic Islands; with two six-year research expertise stretches recognized by the Spanish Government and sixteen years of teaching experience at the University. She is the co-Director of the Master in Nutrigenomics and Personalised Nutrition. She is also an active researcher; at present, her research is focused in the field of gene-nutrient interactions and the relationship of nutrients and early nutritional interventions with the prevention of metabolic disorders associated to energy control, obesity and associated disorders, including the effect on adipose tissue, skeletal muscle and brain health. She has participated in numerous international cooperative research projects.

Requirements

Recommendable

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

Specific

* 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.

Generic

* 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.

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* 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.

Basic

* You may consult the basic competencies students will have to achieve by the end of the Master's degree at the following address: http://estudis.uib.cat/master/comp_basiques/

Content

Theme content

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.

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* 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

In-class work activities

Modality	Name	Typ. Grp.	Description	Hours
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, each student will have a maximum of 30 min. and, afterwards, the students must answer specific questions set by the lecturer. The oral defence must be done the day set for it on the subject timetable or the day set for exam in February or July.	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 and the assignation of the scientific article to review to develop activity 2 and the preparation of the works for the activity 1. The objective is to follow students'progress and supervise the assessment works.	2

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to whether the subject work plan will be carried out through the schedule or through another way included in the Campus Extens platform.

Distance education work activities

Modality	Name	Description	Hours
Individual self-study	Activity 1	Preparation of some 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 two weeks before the day set for exam in February or July. The objective is to put in practice the theory concepts learnt in the subject by the interpretation of specific scientific bibliography.	50

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Modality	Name	Description	Hours
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 and to solve the practical problems presented in the lessons. The solved exercises must be delivered the day set for it on the subject timetable or two weeks before the day set for exam in February or July. 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. .	20
Group or individual self-study	Activity 2	Review and critical analysis of a scientific article on the Molecular Nutrition (student's choice in consultation with the teacher) with special emphasis on the techniques and protocols used. This work will be used to prepare the oral presentation. A written outline of the presentation must be delivered the day set for it on the subject timetable or two weeks before the day of the oral defense, if it would be in February or July. The objective is to put in practice the theory concepts learnt in the subject by the interpretation of specific scientific bibliography.	40

Specific risks and protective measures

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 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

Activity 2: Students'oral presentations

Modality	Seminars and workshops
Technique	Oral tests **(retrievable)**
Description	The work prepared by the students, must be defended by oral presentation accompanied with a slide presentation. For the oral defence, each student will have a maximum of 30 min. and, afterwards, the students must answer specific questions set by the lecturer. The oral defence must be done the day set for it on the subject timetable or the day set for exam in February or July.
Assessment criteria	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.

Final grade percentage: 30% with minimum grade 5

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Laboratory sessions

Modality	Laboratory classes
Technique	Attitude scales **(non-retrievable)**
Description	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.
Assessment criteria	Two items: a) Completing the time screduled in the laboratory (30%) and b) the attitude, interest and capacities for the work performed (70%).

Final grade percentage: 20%

Activity 1

Modality	Individual self-study
Technique	Papers and projects **(retrievable)**
Description	Preparation of some 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 two weeks before the day set for exam in February or July. The objective is to put in practice the theory concepts learnt in the subject by the interpretation of specific scientific bibliography.
Assessment criteria	Quality of the written report delivered, taking into account the contents, structure and the correct use of the bibliography.

Final grade percentage: 40%

Study of the theory contents and lesson exercises

Modality	Individual self-study
Technique	Short-answer tests **(non-retrievable)**
Description	The students are advised to study the slides of the lessons and to consult the recommended bibliography and to solve the practical problems presented in the lessons. The solved exercises must be delivered the day set for it on the subject timetable or two weeks before the day set for exam in February or July. 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. .
Assessment criteria	Quality and accuracy of the answers to the questions.

Final grade percentage: 5%

Activity 2

Modality	Group or individual self-study
Technique	Papers and projects **(non-retrievable)**
Description	Review and critical analysis of a scientific article on the Molecular Nutrition (student's choice in consultation with the teacher) with special emphasis on the techniques and protocols used. This work will be used to prepare the oral presentation. A written outline of the presentation must be delivered the day set for it on the subject timetable or two weeks before the day of the oral defense, if it would be in February or July.

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	The objective is to put in practice the theory concepts learnt in the subject by the interpretation of specific scientific bibliography.
Assessment criteria	Quality of the written outline of the oral presentation delivered, taking into account the contents, structure and the correct use of the bibliography.

Final grade percentage: 5%

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.).

Basic bibliography

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.

Complementary bibliography

Articles in scientific journals indexed by ISI

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