Universitat de les Illes Balears

Academic year	2010-11
Subject	10536 - Membrane Biochemistry
Group	Group 1, 2S
Teaching guide	A
Language	English

Subject identification

Subject	10536 - Membrane Biochemistry
Credits	4.8 attended (120 Hours) 2.2 non-attended (55 Hours) 7 total (175 Hours).
Group	Group 1, 2S(Campus Extens)
Semester	
Teaching language	English

Lecturers

Lecturers	Office hours for students					
	Start time	End time	Day	Start date	End date	Location
Francisca Mª de Lluch Barceló Mairata francisca.barcelo@uib.es	There are no sessions set					

Degrees where the subject is taught

Degree	Character	Course	Studies
Master's Degree in Neurosciences	Optional		Postgraduate degree

Contextualisation

1- INTRODUCTION TO THE COURSE 'BIOCHEMISTRY OF MEMBRANES'
The study of membranes is covered by a number of diverse scientific disciplines ranging from Cell Biology, Biochemistry and Biophysics to Molecular Biology. Our perspectives are those of a biochemist. At the molecular level, there is a close relationship between membrane structure and function. Thus, the course program has been organized primarily around molecular structure and structure-function correlations.
In this course, we will discuss the principles that govern the structure and function of cell membranes. Concepts of structure and function of membrane lipids and membrane proteins will be studied. Students will be introduced to the different classes of membrane proteins using examples that play important roles in human health and diseases. The course will progressively develop your skills in reading and understanding scientific literature.
Students should also appreciate that our knowledge of cell membranes is based on observation and therefore, experimental work is vital in order to examine membranes from a structural point of view and to discover how they carry out their functions. To gain some experience of this, we have included experimental work which will allow you to conduct experiments with model membranes (liposomes). You will also have the opportunity to become familiar with microcalorimetry techniques and integrate basic methodologies of Biochemistry in the membrane protein studies.
Some details of the main topics to be covered throughout this course, in addition to a brief outline of the contents of the lectures are given below. Each topic will be studied over several lectures. The intranet (in-house on line communication system) and internet are both fundamental resources of this course and you are strongly advised to consult these pages as they contain important information. Furthermore, study questions,

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group discussions, oral presentations, recommended readings and web-page addresses accompany these topics and form an integral part of the methodology.

2-THE COURSE AIMS
The principle objective of this course is to study the nature of the biological membranes and their structure and function from a molecular point of view. The specific and general aims of the course are:
-Specific course aims
· To analyse the composition and biological activity of the biomembranes, focusing on lipids and proteins and their interactions.
· To provide you with a conceptual framework for understanding the structure and dynamics of biological membranes.
· To carry out experimental work in order to become familiar with liposomes as model membranes and explore experimental tools of biochemistry and biophysics used in research in biomembranes.

-General course aims
· To develop your skills in reading and understanding scientific literature
· To develop communication skills using specific software for oral presentations and written reports.

Requirements

Essential

Basic course in Biochemistry
Students who require more information, please contact with F. Barceló

Skills

Specific

1. - Specific course outcomes -To characterize the functional components and characteristics of cell membranes -To discuss the membrane structure and related dynamic properties -To understand the bases of lipid polymorphism and to characterize membrane microdomains -To identify the types and characteristics of membrane proteins and to describe their structural features. -To correlate the membrane properties and membrane proteins with their role in cell functions mediated by membranes. -To recognise some experimental techniques used to study membranes and membrane proteins..

General

1. Generic course outcomes: -To analyse and evaluate experimental data and to summarize the results in a scientific report -To give an oral and a written presentation -To work effectively in a student team -To

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read scientific publications and interpret experimental approaches -To understand and use English as a scientific language -To consolidate their Information Technology (IT) skills.

Content

- SYLLABUS
Topic: Overview of the architecture of cell membranes
Lecture 1: Cellular organelles are defined by membranes. What does a cell membrane look like?. Eucariotic and Procariotic cell membranes. General properties of cell membranes.

Topics: The Membrane Structure and properties
Biomembranes as dynamic systems
Lecture 2: Cell membrane building blocks. General features. The cell membrane lipid composition. Structure and properties of membrane lipids.

Lecture 3: The architecture of cell membranes. The fluid mosaic model: experimental evidence. What does the fluid-mosaic model say?. Structural basis of membrane fluidity. Lipid movements in membranes. How is the lipid asymmetry generated and maintained in a cell membrane?. Membrane asymmetry and functional significance.
Lecture 4: Lipid polymorphism. Liposomes as synthetic lipid bilayers. Lipid phase transition. Lipid-lipid interaction. Lipid phase separation. Microdomains within the membranes. Biological significance.

Topic: Membrane proteins: properties and functions
Lecture 5: General properties of membrane proteins. Classification of membrane proteins. Structural features of membrane proteins.

Lecture 6: Introduction to lipid-protein interactions. Lipid effect on membrane protein properties. Model peptides to study lipid-protein interactions.

Lecture 7: Analysis of membrane proteins by means of examples: channels, and carriers. Membrane receptor classes. Signal transduction by G-protein coupled receptors and G proteins. Tyrosine Kinase receptors.

Seminar 1: Liposomes as model membranes and applications. Basic outline of biophysical techniques used to conduct experiments with liposomes.

Seminar 2: Isolation and characterization of biological membranes and membrane components. Membrane protein reconstitution in lipid membranes.

Thematic content

Topic 1. Overview of the architecture of cell membranes

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Teaching methodology

LEARNING ACTIVITIES hours (attendance)/course
1- Theoretical Component
Lectures (16)

Study questions
Discusión of scientific articles
- Individual
- In group
Seminars (4)
ECTS Tutorials: group activity and guided discussion (2)
Oral presentation and written report of course project

2- Independent study
- Preparation of the course project
- Individual
- In group
Presentation of the course project
- Individual
- In group

Study questions
Self-assessment exercise

3- Practical component
Experimental work in the laboratory (15)
Data analysis
Prepare the laboratory book notes and the Laboratory Report

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- Individual
- In group

4- Additional activities
Tutorials (individual)
Attendance at lectures

EVALUATION CRITERION
Continuous Assessment 35%
Report of the experimental work 15%
Oral/written presentation of the project 50%

Attended activities

Type	Name	G. type	Description
Theory classes		Large group (G)	Lectures

Non-attended activities

Type	Name	Description
Group or individual self-study		Preparation of the course project Study questions Self-assessment exercise Prepare the laboratory book notes and the Laboratory Report

Workload estimate

Type	Name	Hours	ECTS	%
Attended activities		**120**	**4.8**	**68.57**
Theory classes		120	4.8	68.57
Non-attended activities		**55**	**2.2**	**31.43**
Group or individual self-study		55	2.2	31.43
	Total	**175**	**7**	**100**

At the beginning of the semester the subject schedule will be available to students through the UIBdigital platform. This schedule will at least include the dates for the continuous assessment exams and assignment deadlines. Furthermore, the lecturer will inform students as to whether the subject syllabus will be carried out according to the schedule or otherwise, including Campus Extens.

Student learning assessment

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This course has three assessment components:
(A)- Continuous Assessment - Your progress will be evaluated throughout this course taking into consideration attendance and class participation, work related to the Study Questions, group activities and discussion.
Successful completion constitutes 30% of the total mark
(B)- Report of the experimental work. This part comprises 20% of the total mark
(C)- An Examinable Component: The final assignment provides an opportunity to explore some of the ideas and practices examined throughout this course. This is in two parts; an oral presentation and a written assignment. You will be asked to form groups, each one to work on different topics. This will take place in mid-May and exact dates will be confirmed in the near future.
The Written Report
This must be completed by the whole group and submitted one week prior to the oral presentation. This report should not exceed 1,500 words and should follow the recommended format for scientific writing that is given in the 'writing Lab Reports document'.
The Oral Presentation
All members of the group must participate in the presentation, presenting their part of the project in a clear and concise manner. This should last approximately 30 minutes, using no more than 25 slides. (Please check 'giving a presentation document').
Written and Oral presentations represent 50% of the total mark and are divided as follows:
Content: 35%
Organization: 15%
Presentation and scientific language skills: 20%
Quality discussion: 30%

Resources, bibliography and additional documentation

COURSE MATERIALS
4.3.1.-On-line material
ppt presentations shown in lectures will be placed on-line (Campus Extens-UIB) weekly.

4.3.2.-Bibliography (with a reading guide)
Text books:
Course discussion will focus on relevant chapters from the following text books:
(A) Biochemistry, 3rd edition. D. Voet, J. G. Voet. 2005. ISBN: 978-0-471-19350-0. Chapter 12.
(B) Molecular Cell Biology. H. Lodish. 2000. WH Freeman and Company
http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=mcb
(C) The Cell. B. Alberts. 2002. Garland Science. Taylor & Francis Group. Chapter 10: http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=mboc4.chapter.1861
(D) Biochemistry. L. Stryer. W.H. Freeman and Company, N.Y. Chapter 11:
http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=stryer.chapter.1626
(E) Lehninger Principles of Biochemistry. D. L. Nelson, M. M. Cox. Third edition. Chapter 12.

Specific books:
(F) Biomembranes. R.B. Gennis. Springer-Verlag N.Y. Inc., 1989. Chapters 1, 2.
(G) Lipid polymorphism and membrane properties. R. Epand. Academic Press, 1997. Chapter 9.
(H) The membranes of cells. Philip L. Yeagle. 1993. Second Edition. Acad. Press, Inc. Chapters 6 and 7.

4.3.3.- Study Questions

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4.3.4- Supplementary materials

Recommended reading articles: You are not obliged to read beyond the course material and the study questions. However, consulting the research

4.3.5.-Other resources
The internet offers links to useful resources and details of sites relevant to this course are given.

(A) 'Biomembranes internet info'
(B) Flash image gallery

Basic bibliography

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(B) Molecular Cell Biology. H. Lodish. 2000. WH Freeman and Company
http://www.ncbi.nlm.nih.gov/books/bv.fcgi'rid=mcb
(C) The Cell. B. Alberts. 2002. Garland Science. Taylor & Francis Group. Chapter 10: http://www.ncbi.nlm.nih.gov/books/bv.fcgi'rid=mboc4.chapter.1861
(D) Biochemistry. L. Stryer. W.H. Freeman and Company, N.Y. Chapter 11:
http://www.ncbi.nlm.nih.gov/books/bv.fcgi'rid=stryer.chapter.1626
(E) Lehninger Principles of Biochemistry. D. L. Nelson, M. M. Cox. Third edition. Chapter 12.
Specific books:
(F) Biomembranes. R.B. Gennis. Springer-Verlag N.Y. Inc., 1989. Chapters 1, 2.
(G) Lipid polymorphism and membrane properties. R. Epand. Academic Press, 1997. Chapter 9.
(H) The membranes of cells. Philip L. Yeagle. 1993. Second Edition. Acad. Press, Inc. Chapters 6 and 7.

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