VNIVERSITAT DE VALÈNCIA

Course Guide
33044 Cellular structure

COURSE DATA

Data Subject	
Code	33044
Name	Cellular structure
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1100 - Degree in Biology	Faculty of Biological Sciences	1	Second term

Subject-matter

Degree	Subject-matter	Character
1100 - Degree in Biology	5 - Biology	Basic Training
1100 - Degree in Biology	6 - Biology	Basic Training

Coordination

Name	Department
CRESPO RUPEREZ, CARLOS	21 - Cellular Biology and Parasitology
PONSODA I MARTI, XAVIER JOSEP	21 - Cellular Biology and Parasitology

SUMMARY

"Structure of the Cell" is taught as a basic training course in the second semester of the first degree course in Biology. With it, it is intended that students acquire in the first grade year all the basics needed to understand how the cell is organized. Given that the cell is the structural and functional basis of living matter, the subject should be considered a cornerstone of the training the student in this grade. The study of cell structure is interrelated at all times to study its function, thus intends to convey a dynamic view of cell biology. From a comparative analysis of different levels of organization of living matter, from viruses to prokaryotes and finally to the eukaryotes. Emphasis will be placed along the course in the structural organization of eukaryotic cells, both animal and plant, studying their maximum levels of complexity.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

OUTCOMES

1100 - Degree in Biology

- Capacidad de análisis, síntesis, trabajo metódico y riguroso.
- Capacidad de análisis crítico de textos científicos.
- Manejo del inglés científico.
- Develop the capacity for organisation and planning.
- Capacidad de presentación escrita y oral de datos científicos.
- Capacidad de divulgación del conocimiento científico.
- Habilidad para el trabajo en equipo.

LEARNING OUTCOMES

- Perform histological preparations for light and electron microscopy
- Interpret electron microscopy images
- Appropriate correspondence between biomolecules and cellular structures
- Appropriate correspondence between cellular metabolic processes and structures
- Identify the stage of cell cycle from histological preparations
- Design experiments on cell function and interpret the results

DESCRIPTION OF CONTENTS

1. Introduction

Methods of Study in Cell Biology. Prokaryotic and eukaryotic cell. Viruses, structure and life cycle. Organization of the prokaryotic cell. Organization of the eukaryotic cell. Animal and plant cell.

2. Plasma membrane

Fluid mosaic model. Components of the membranes. Membrane receptors, ion channels, transporters and ion pumps. The chemical potential and the electrical potential of membrane.

3. Cell nucleus

Nuclear envelope. Nuclear pores. Chromatin organization. Ribonucleoprotein structure. The nucleolus. Structure and biogenesis of ribosomes.

4. Endomembrane system

Smooth endoplasmic reticulum. Rough endoplasmic reticulum. Distribution and transport and protein degradation. The ubiquitin-proteasome system. Golgi apparatus. Lysosomes. Vacuoles. Peroxisomes. Glyoxysomes. Endocytosis. Exocytosis. Vesicular traffic.

5. Cytoskeleton

Intermediate filaments. Microtubules, microtubule organizing center, cilia and flagella. Microfilaments. Cell mobility.

6. Cell surface

Intercellular contacts. Cell polarity. Glycocalyx. Tight junctions. Adherens junctions. "Gap" junctions. Plasmodesmata. Cell adhesion proteins. Membrane receptors. Cell signaling.

7. Extracellular matrix

Cell wall. Collagen. Elastic fibers. Adhesive glycoproteins. Basal lamina. Amorphous matrix. Biogenesis of matrix components.

8. Mitochondria and chloroplasts

Mitochondrion structure. Electron transport chain and ATP synthesis in mitochondria. Transport of proteins into mitochondria. Mitochondrial biogenesis. Structure of chloroplasts. Components of thylakoid membranes. Types of plastids. Biogenesis of plastids. Endosymbiont theory.

9. Cell cycle

Cell cycle phases. Mitosis: stages of mitosis. Metaphase chromosomes. Cytokinesis. Notions of cell cycle regulation. Stem cells. Cellular senescence and apoptosis.

10. Meiosis

Phases of meiosis. Sexual and asexual reproduction. Gametogenesis in animals. Spermatogenesis and spermiogenesis. Oogenesis.

11. Fertilization and embryonic development

Fertilization, cleavage and gastrulation. Cell differentiation. Germ layers.

12. Practical classes

PRACTICE 1.-The optical microscope: types. Sample preparation.
PRACTICE 2.- Inclusion and microtomy.
PRACTICE 3.- Dyes and Stains.
PRACTICE 4.- Cell proliferation and division processes.
PRACTICE 5.- Cell cultures (I).
PRACTICE 6.- Cell cultures (II). Organelles labelling.
PRACTICE 7.- Electron microscopy: types. Sample Preparation.
PRACTICE 8.- Observation and study of organelles in electron microscopy micrographs (I).
PRACTICE 9.- Observation and study of organelles in electron microscopy micrographs (II).

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	39,00	100
Laboratory practices	18,00	100
Tutorials	3,00	100
Development of group work	10,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	40,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The acquisition of knowledge by the student, will be based on four cornerstones:

1. Theory classes.

Theory classes consist of one hour classroom sessions where the teacher orally transmitted knowledge of the subject the student. This transmission is supported at all times of the materials the teacher deems appropriate for each topic.

In the lectures, the teacher will encourage student participation by asking questions or approach issues and questions arising out of debate.

Virtual Classroom will be used as a tool where the teacher can provide students with all learning materials it deems appropriate to supplement the lectures.

2. Practical classes.

Practical classes will consist of laboratory sessions of two hours where the student works on different topics of the course. In general, it is intended that the methodology used in these sessions for learning is very variable.

In some sessions, the student becomes familiar with the use of the microscope as a basic tool for the analysis of cells and with the most basic techniques of sample preparation.

In other sessions, the student will prepare their own samples, performs some simple stains and interpret them with the optical microscope.

There are also sessions where the student looks at photographs of different preparations and optical microscopy and transmission electron. This is intended to recognize and identify all components of cells.

3. Interdisciplinary Activity: Poster.

Conducting a scientific poster on this subject type arises from an interdisciplinary perspective in conjunction with other subjects of the same course, mainly with "Basic Tools in Biology." Students will prepare in small groups interdisciplinary poster on a topic proposed by the teachers of these subjects, to do so on the advice and help from teachers. You have to make an oral presentation of the poster, as part of a congress of Biology to be held at the end of the course. The poster and presentation will be evaluated jointly by the subject teachers concerned.

Alternatively to this activity, it can make other interdisciplinary activity of a project of educational innovation supported by the CAT

4. Student's class work.

Should be considered as all the work that the student engaged in the preparation of the course regardless of attendance at lectures, practices, seminars, tutorials and exams. Includes various activities.

On one side are the hours of study each week to be spent to expand and consolidate the knowledge acquired in the classroom and in practical classes.

It also includes additional work that the teacher can plan for the student to perform throughout the semester to supplement the lectures and practices (answering questionnaires, editing pictures or diagrams that provide the teacher on some issues, present written work, conduct literature searches ...). All this extra work may arise in some cases as individual work and in others as a collective work to be done in small groups.

To complement the above, the methodology also includes tutorials, raised as one-hour sessions that will assist the teacher can track the degree of student learning. Sessions were presented as open to dialogue and participation of all students, which will formulate and solve questions and discuss concerns or issues which interest related to the knowledge of the subject.

EVALUATION

Learning in this course will be assessed considering the one hand, the knowledge acquired in the lectures and practices, and on the other hand, the evaluation obtained in the posters. Therefore, the course is divided into "two blocks of evaluation" independent.

1. - Evaluation on first call
Block theory and practice:
The grade obtained in this block computes 90% of the final grade.
To assess the knowledge acquired in this block, the student will be a written test consisting of two parts: theory and practice.

To pass the course will be required to have passed the theoretical and practical block, where the student must obtain a minimum of 5/10 points in the respective questions of theory and practice. The marks obtained in the theory will involve 80% of the final grade in this block. The grade obtained in the practices will involve the remaining 20%.

Block posters:
The grade obtained in this block will compute the remaining 10% of the final grade.
This note will be the result of the joint, centralized assessment done at the end of course of all groups.

If adding the two blocks, having passed the theoretical and practical block, students suspend matter if they get a final mark of less than 5.

Two. - Assessment on second call
Students must perform the examination of theoretical and practical block in the same conditions as in the first call.

REFERENCES

Basic

- Alberts, B. et al. (2011) Introducción a la Biología Celular, 3a ed, Panamericana, México.
- Alberts, B., et al. (2016) Biología Molecular de la célula, 6a ed, Omega, Barcelona.

- Becker, W.M., Kleinsmith, L.J., Hardin, J. (2006) El mundo de la célula, 6a edn, Pearson Addison Wesley, Madrid.
- Cooper, G.M. (2014) La célula, 6ª ed, Marban, Madrid.
- Cooper, G.M. (2016) The Cell: A Molecular Approach, 7a ed, Sinauer, Sunderland MA
- Gilbert, S.F. (2016) Developmental biology, 11th edn, Sinauer, Sunderland MA.
- Karp, G. (2014) Biología celular y molecular: conceptos y experimentos, 7a ed, McGraw-Hill Interamericana, México.
- Lodish, H. et al. (2016) Biología celular y molecular, 7a ed, Médica Panamericana, Buenos Aires
- Lodish, H. et al. (2016) Molecular cell biology, 8th edn, W. H. Freeman, New York

Additional

- Bloom y Fawcett (1995) Tratado de Histología. 12ª ed,. Interamericana.
- Cortes (1980) Histología Vegetal Básica. Blume.Histología y Organografía Animal.
- Fahn (1985) Anatomía Vegetal. Blume.
- Gartner, L.P. y Hiatt, J.L. (1997). Histología. McGraw-Hill Interamericana, México.
- Gartner, L.P. y Hiatt, J.L. (2001). Color Textbook of Histology. W B Saunders Co; Philadelphia.
- Geneser, F. (2000). Histología, sobre bases biomoleculares. 3ª ed. Médica Panamericana, Buenos Aires.
- Houillon (1972) Embriología. Omega.
- Krstic (1984) Illustrated Encyclopedia of Human Histology. Springer Verlag.
- Krstic (1989) Los tejidos del Hombre y de los Mamíferos. McGraw Hill.
- Paniagua et al. (1997). Citología e Histología Vegetal y Animal. 2ª ed. Interamericana-McGraw-Hill.
- Paniagua, R., M. Nistal, P. Sesma, M. Alvarez-Uria, B. Fraile, R. Anadón, F. J. Sáez, M. Paz de Migual, M. (1999). Biología Celular. 1. ed. McGraw Hill. Interamericana
- Raven et al. (1991). Biología de las Plantas. Tomo 1. Reverté.
- Rhodin (1974) Histology, a text and atlas. Oxford.
- Robards (1971) Electron Microscopy and Plant Ultrastructure. McGraw-Hill.
- Ferrer, J.R. (1997) Las células de los tejidos vegetales . Ed. Vedrà, Barcelona
- Weiss (1988) Cell and Tissue Biology. A Textbook of Histology. 6th ed, Urban & Schwarzenbert

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

1. Contenidos

Se mantienen los contenidos recogidos inicialmente en la guía docente. El profesor subministra a los estudiantes los materiales elaborados adecuados para conseguir los objetivos inicialmente programados.

2. Volumen de trabajo y planificación temporal de la docencia

Se mantienen las actividades que suman las horas de dedicación en créditos ECTS marcadas en la guía docente original, con mayor flexibilidad, adaptándose a las circunstancias que se requieran.

Las sesiones presenciales se sustituyen por sesiones de tutoría en línea (chat, correo electrónico o de otros tipos, según las posibilidades técnicas).

Dentro de la parte de preparación del estudio de la materia se incluyen actividades complementarias de autoevaluación.

3. Metodología docente

Para sustituir la docencia presencial se refuerza la comunicación virtual (chats, fórum del Aula Virtual y/o correos electrónicos), así como el suministro de materiales más elaborados que los inicialmente facilitados a los estudiantes.

En este sentido, se han elaborado presentaciones de diapositivas de los diferentes temas y actividades de la asignatura, todas ellas adaptadas y editadas para facilitar el estudio por parte del estudiante en condiciones de no presencialidad. También se han elaborado materiales adicionales, como apuntes, para reforzar el aprendizaje y cuestionarios de autoevaluación.

4. Evaluación

Las actividades complementarias de autoevaluación tendrán un peso del 20% dentro del apartado del examen teórico-práctico. De modo que este apartado queda con un 20% de las autoevaluaciones y un 80% del examen. Dentro del examen, la parte teórica tendrá un peso del 80% y la práctica del 20%.

Para la nota final, la parte de actividades transversales continúa teniendo un 10% y el apartado del examen (incluyendo las autoevaluaciones) un 90%.

El examen final será escrito y constará de diferentes partes, incluyendo preguntas de diferentes formatos, que permitan evaluar todos los contenidos y competencias de la materia. Si no se puede hacer algún examen de manera presencial, se hará mediante el uso de las herramientas de la plataforma Aula Virtual.

Si una persona no dispone de los medios para establecer conexión y acceder al aula virtual, deberá contactar con el profesorado por correo electrónico en el momento de publicación de este anexo a la guía docente.

Si por causas técnicas, debidamente justificadas, algún estudiante no puede realizar algún examen, se estudiará la posibilidad de realizar una prueba alternativa que, en todo caso, será de tipo oral.