COURSE TITLE / ASIGNATURA

CELL BIOLOGY

1.1. Course number / Código

18871

1.2. Content area / Materia

CELL BIOLOGY

1.3. Course type / Tipo

COMPULSORY SUBJECT

1.4. Course level / Nivel

BACHELOR

1.5. Year / Curso

1st-2nd

1.6. Semester / Semestre

1st SEMESTER

1.7. Credit allotment / Número de créditos

6 ECTS CREDITS

1.8. Prerequisites / Requisitos previos

Previous knowledge on biology is required. Students from Boston University are expected to have followed CAS BI 108 and CAS CH 102 or equivalents. Students from Universidad Autonoma de Madrid should have taken a previous course of General Biology, equivalent to a last High School year (2º Bachillerato) or First Degree Course at University.

1.9. Minimum attendance requirement / Requisitos mínimos de asistencia a las sesiones presenciales

Attendance is highly recommended for theoretical lessons and is mandatory for seminars.

1.10. Faculty data / Datos del equipo docente

INSTRUCTORS

ROCÍO GÓMEZ LENCERO		
e-mail: rocio.gomez@uam.es	Phone: 914978242	Web page:
Department: Biology	Faculty of Sciences	
Office hours: From Monday to Friday previous appointment		Office: CA113 Biology Building

1.11. Course objectives / Objetivos del curso

GOALS OF THE COURSE:

1.- Acquire basic knowledge of eukaryote cell components: molecules, genomes and organelles.

2.- Understand the main processes operating in cells: genome expression, protein synthesis, intracellular trafficking, membrane transport, cell movement, cell communication, cell adhesion, cell proliferation and differentiation.

3.- Develop data analysis competences and critical thinking.

4.- Acquire basic skills for communication of scientific contents.

1.12. Course contents / Contenidos del programa

FIRST PART: INTRODUCTION. ORGANIZATION AND PROCESSING OF GENETIC INFORMATION

1. Introduction: features of eukaryote cells. Origin and evolution of cells.
2. Fundamentals of cell biochemistry: sugars, lipids, proteins and nucleic acids.
3. Research tools in cell biology: cell cultures, model organisms, molecular techniques, cellular and organism modification, microscopy techniques.
4. Cell nucleus: nuclear envelope, chromatin structure and nuclear compartmentalization.
5. Genome organization: types of DNA sequences and their proportions and origin.
6. DNA: replication, repair and recombination.
7. RNA: transcription and processing.
8. Proteins: synthesis, folding and degradation.

SECOND PART: CELL SURFACE AND ORGANELLES

9. Cell membranes: composition, organization and dynamics.
10. Membrane transport: passive diffusion, passive transport, active transport, endocytosis and exocytosis.
11. Protein sorting and transport I: endoplasmic reticulum and the secretory pathway.
12. Protein sorting and transport II: Golgi apparatus, vesicular transport and lysosomes.
13. Bioenergetics and metabolism: mitochondria, chloroplasts, cellular energetics and peroxisomes.
14. Cell surface: cellular interactions and extracellular matrix.
15. Cell signaling: signaling molecules and receptors, transduction mechanisms and signaling pathways.

THIRD PART: CYTOSKELETON AND CELL PROLIFERATION

16. Actin microfilaments: organization, polymerization, regulation and functions.
17. Intermediate filaments: organization, polymerization, regulation and functions.
18. Microtubules: organization, polymerization, regulation and functions.
19. Cell cycle: phases of the cell cycle, regulation by CDK-cyclin complexes, checkpoints.
20. Mitosis: phases and events of mitosis, checkpoints, APC, cytocinesis.

21. Cell differentiation and death: stems cells, differentiation of cells in tissues, events of apoptosis, intrinsic and extrinsic apoptotic pathways.
22. Cancer: cellular approaches to cancer study and therapy.

SEMINARS PROGRAM

The program of the course is complemented with seminars. These will mainly focus on the discussion of Cell Biology topics through the review of classical experiments or the presentation of recent research on specific topics.

1.13. Course bibliography / Referencias de consulta

The organization and contents of the course will mainly follow the book:

- **Cooper, G.M. and Hausman, R.E.** The Cell, A Molecular Approach. 7th Edition. Sinauer Associates, 2016.

Other recommended bibliography:

- **Alberts, B., Bray, D., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P.** Molecular Biology of the Cell. B. 6th Ed. Garland Science, 2015.
- **Alberts, B., Bray, D., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P.** 2013. Essential Cell Biology. Garland Science. 4th Edition.
- **Hardin, J., Bertoni, G.P. and Kleinsmith, L.J.** 2011. Becker's World of the Cell. Pearson/Benjamin Cummings. 8th Edition.
- **Lodish, H. Kaiser, C.A., Bretscher, A., Amon, A., Berk, A., Krieger, M., Ploegh, H and Scott, M.P.** 2013. Molecular cell biology. 7th Edition. Macmillan.
- **Pollard, T.C., Earnshaw, W.C. and Lippincott-Schwartz, J.** 2007. Cell Biology. Elsevier. 2nd Edition.

2. Teaching methodology / Métodos docentes

LECTURES

The goal of the course is to understand the fundamental principles of cell biology. The aim of the lectures is to convey to the students the theoretical contents of the

composition and functions of cells. Lectures will have a duration of 50 minutes, where the lecturer will present in a simply way the contents of each topic always encouraging students to participate with questions and comments.

SEMINARS

The theoretical program will be accompanied by 8 seminars of 1 hour each. These seminars seek to encourage students analyze the experimental nature of contemporary research in the Cell and Molecular Biology and understand its relationship with the fundamental background information given during the theoretical lectures. Students will prepare a short lecture (30-45 minutes) in small groups (3-4 people) about one topic related to the contents of the course. The rest of the students could engage in a discussion about the topic. After the talk, the speakers will provide a set of questions about their talk to be included in a seminar test at the end of the course.

TUTORIALS

The University recommends that students attend tutorials for the resolution of questions regarding the content of the course. These tutorials will be held individually and upon request with the teacher assigned.

3. Student workload / Tiempo de trabajo del estudiante

ACTIVITY	Attendance hours	Autonomous work hours	TOTAL
LECTURES	44	80	124
SEMINARS	8	10	18
EXAMS	6	2	8
TOTAL WORKLOAD:	58	92	150

4. Evaluation procedures and weight of components in the final grade / Métodos de evaluación y porcentaje en la calificación final

Student's final grading will be based on the understanding of theoretical concepts (80%) and participation in seminars (20%).

THEORY

Theory contents will be divided in three parts. There will be two mid-term evaluations and one final evaluation scheduled, covering the complete syllabus. These exams will review the knowledge and skills collected by the students during the course. The 80% of the grade that corresponds to theory concepts will be based on the result of the 3 examinations, with the two mid-term evaluation exams weighing 25% of the total grade and the final evaluation exam being the remaining 30% of the total grade.

SEMINARS

The 20% of the total grade will be based on seminars. A 10% will be accounted by student skills for understanding and communicating the concepts exposed in their talk. Other 10% will be accounted by a quiz including questions from all of the seminars.

Summary of the assessment rates	
	Percentage of the final grade
First evaluation exam	25%
Second evaluation exam	25%
Final evaluation exam	30%
Seminars	20%
TOTAL	100%

5. Course calendar */ Cronograma*

*This calendar is tentative.

THEORY/SEMINARS

FIRST PART: INTRODUCTION. GENETIC INFORMATION ORGANIZATION AND PROCESSING

- Theory lessons: 17 hours
- Discussion seminars: 2 hours
- Review and mid-term evaluation exam: 2 hours

SECOND PART: CELL SURFACE AND ORGANELLES

- Theory lessons: 16 hours
- Discussion seminars: 2 hours
- Review and mid-term evaluation exam: 2 hours

THIRD PART: CYTOSKELETON AND CELL PROLIFERATION

- Theory lessons: 12 hours
- Discussion seminars: 4 hours
- Review and final evaluation exam: 3 hours

Week	Contents	Contact hours	Independent study time
1	Introduction Organization and processing of genetic information	3	6
2	Organization and processing of genetic information	4	6
3	Organization and processing of genetic information	4	6
4	Organization and processing of genetic information	4	6
5	Organization and processing of genetic information Seminars **Mid-term evaluation**	7	6
6	Cell surface and organelles	5	6
7	Cell surface and organelles	5	6
8	Cell surface and organelles Seminar	4	6
9	Cell surface and organelles Seminar **Mid-term evaluation**	5	6
10	Cytoskeleton and cell proliferation	3	6

Week	Contents	Contact hours	Independent study time
11	Cytoskeleton and cell proliferation Seminar	4	6
12	NO ACTIVITIES (Organic Chemistry laboratory)		6
13	Cytoskeleton and cell proliferation	3	6
14	Cytoskeleton and cell proliferation **FINAL EVALUATION**	9	6