COURSE DATA

DATA SUBJECT

Code: 36349
Name: Evolutionary Biology
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Facultat de Ciències Biològiques	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	Biología	BASIC

COORDINATION

GARCIA MARTINEZ JOSE

SUMMARY

Biology is a compulsory and basic subject in the Degrees in Biochemistry and Biomedical Sciences and in Biotechnology of the University of Valencia that, taught at the start of the formative process of the students, familiarises them with the scientific theory that unifies and integrates the knowledge taught in the remaining biological disciplines. This is part of the matter Principles of Biology together with the subject Biological Diversity. The main aim of this subject is to offer a vision of the biology through several issues of special relevance in the context of current science and society, including:

-Theory of the evolution.

-Natural selection.

-Adaptation and speciation.

-Other processes of evolutionary change.

-Populations, communities and sustainability.

-Crisis of biodiversity.

-Human diversity.

-Biology and gender.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

There are no specified enrollment restrictions with other subjects.

COMPETENCES / LEARNING OUTCOMES

1109 - Degree in Biochemistry and Biomedical Sciences

Be able to think in an integrated manner and approach problems from different perspectives.

Be able to use new information and communication technologies.

Develop an ethical commitment and the capacity to participate in the social debate.

Have capacity for analysis, synthesis and critical reasoning in the application of the scientific method.

Know how to use mathematical and statistical tools to solve biological problems.

Know how to use the different bibliographic sources and biological databases and be able to use bioinformatic tools.

Know the common and differential molecular and cellular elements of the different types of living organisms with special emphasis on the human being and model organisms for their study.

Know the usual procedures used by scientists in the area of molecular biosciences and biomedicine to generate, transmit and disseminate scientific information.

Recognise biological diversity and know the organisation of living beings and the position of human beings and model organisms in biomedical experimentation amid this diversity.

Show initiative and leadership for multidisciplinary teamwork and cooperation.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

Understand experimental approaches and their limitations and interpret scientific results in molecular biosciences and biomedicine.

Understand the natural world as a product of evolution and its vulnerability to human influence.

Understand the relationships between science and society and the position of molecular biosciences and biomedicine in the context of current science.

Understand the role of the expert in molecular biosciences and biomedicine in the scientific and social context.

DESCRIPTION OF CONTENTS

1. The finding and the concept of the Evolution

A case to think evolutionarily. Brief history of the evolutionary thought: from fixixm to the New Synthesis. Criticism and evidence in favor of evolution. Natural selection to explain diversity and adaptation.

2. Decoding the tree of life

The phylogenetic perspective of biology: the tree of the life. Classification and systematics. Homologies and analogies. Principles of phylogenetic inference. The main schools of classification. The use of phylogenies to answer to evolutionary questions.

3. Genetic processes in Evolution I

The origin of new alleles. Origin, description and quantification of genetic variability. The Hardy Weinberg equilibrium.

4. Genetic processes in Evolution II

Mechanisms of evolutionary change. Selection. Mutation. Migration. Genetic drift. Nonrandom mating. Evolution of multigenic characters.

5. Evolution of genes and genomes

Analysis of the evolutionary change at the molecular level. The Neutral Theory. The molecular clock. The origin of new genes. The genome as an evolutionary unit. Compared Evolution of genomes.

6. The origin of species

The species concept. Mechanisms of isolation. Biogeografic patterns in speciation. Genetic differentiation along the speciation process.

7. Selection, adaptation and evolution of life strategies

The study of adaptation. Tradeoffs and restrictions. The origin of complex characters. Evolution of sex. Sexual selection. Levels of selection and genomic conflict.

8. The evolution of form

The origin of the body patterns. Homeotic Mutations and hox genes. The dynamics of the morphological change: heterochrony versus recapitulation.

9. Human evolution

The relationship between humans and current apes. The ancestors of humans. The origin of presentday humans. The evolution of human specific characters.

10. The origin of life

Prebiotic chemistry. The world of the RNA. Catalytic RNAs. From the RNA world to the Last Universal Common Ancestor.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	46,00
Computer classroom practice	4,00
Classroom practices	8,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	4,00
Individual or group project	10,00
Independent study and work	76,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The subject is organized around different learning activities including the following:

- **Theoretical lessons** in which the lecturers will present the fundamental concepts of each lesson, using audiovisual resources that will be previously accessible for the students through the usual platforms. It will address the students to the suitable bibliography and the resources to use for a deeper study of the presented concepts and will emphasize those aspects related with the conferences and the homework dealed with during the classroom activities.
- **Conferences** on current topics in Biology that will be useful to illustrate concepts introduced in the classroom and will help the students to get an integrated perspective. These conferences will be usually chosen from those offered in conference cycles ongoing in the Faculty of Biological Sciences or other centres of the University of Valencia. Later on, the students will be asked to present a summary of some selected conferences.
- **Classroom Activities**. Students organized in groups will prepare and discuss, with the moderation of the teacher, a series of specific topics based on scientific papers that will be related with the main concepts that appear in the theory sessions. Two practical sessions in the computer room are also scheduled for the analysis of simulated and real data.
- **Group tutoring sessions**. Sessions with reduced student groups to discuss doubts, and/or resulys obtained by the different groups in the classroom activities.
- **On-line individual tutoring**.

EVALUATION

A continuous evaluation of each student will be carried out, based on the different activities described in the Methodology section. Assistance to all the activities will be considered in addition to, the execution and presentation in time of all tasks and complementary activities The degree of participation and of involvement in the process of education-learning will also be considered. The particular aspects to evaluate will be the following:

- **Exam**. An examination of knowledge will be taken with questions on both theory and practical issues. This test will represent a **70%** of the final mark. The minimum mark in the exam needed to pass the course will be 5 in a 0 to 10 scale.

-The marks obtained on the **homework** and on the classroom activities and computer will contribute

altogether to **20%** of the global mark.

-Assistance to interdisciplinary **conferences** programmed during the first term, and preparation of a summary will represent a **10%** of the final mark.

REFERENCES

BASIC

- Barton N.H., Briggs, D.E.G., Eisen, J.A., Goldstein, D. B., y Patel, N.H. 2007. Evolution. CSHL Press.
- Fontdevila, A., y Moya, A. 2004. Evolución. Editorial Síntesis, Madrid.
- Freeman, S., y Herron, J.C. 2002. Análisis evolutivo. Prentice Hall, Madrid.
- Freeman, S., y Herron, J.C. 2007. Evolutionary analysis. 4th edition. Prentice Hall.
- Futuyma, D.J. 2009. Evolution. 2nd edition. Sinauer.
- Ridley, M. 2004. Evolution. 3rd edition. Blackwell.
- Stearns, S.C., y Hoekstra, R.F. 2005. Evolution: An introduction. 2nd edition. Oxford University Press, Oxford.
- Avise J.C. (2000) Phylogeny: The history and formation of species. Harvard University Press, Cambridge, Massachusetts.

ADDITIONAL

- Ayala, F.J. (1999). La teoría de la evolución. De Darwin a los últimos avances de la Genética. Temas de Hoy.
- Ayala, F.J.., 2007. Darwin, Darwin y El Diseño Inteligente : Creacionismo, Cristianismo Y Evolucion. Alianza Editorial.
- Carrión, J.S. 2003. Evolución Vegetal. Diego Marín, Murcia.
- Cowen, R. 2005. History of Life. 4th Edition. Oxford, Blackwell Publishing.
- Dawkins, R. 2009. Evolución. El mayor espectáculo sobre la Tierra. Espasa.
- Dawkins, R., 1979. El gen egoista. Ed Labor.
- DeSalle, R., Giribet, G. & Wheeler W. (2001) Molecular Systematics and Evolution: Theory and Practice. Birkhauser.
- Endersby, J. 2009. Una historia de la biología según el conejillo de Indias. Las plantas y los animales que nos han enseñado a entender la vida. Ed. Ariel.
- Felsenstein J. (2004). Inferring phylogenies. Sinauer Associates, S underland, Massachusetts.
- Hall, B.G. 2000. Phylogenetics Trees Made Easy: A How-To Manual for Molecular Biologists. Sinauer Assoc. Inc.
- Hillis D.M., Moritz C., and Mable B.K., eds. (1996). Molecular systematics, 2nd ed. Sinauer Associates, Sunderland, Massachusetts.
- Majerus, M., Amos, W. y Hurst, G. 1996. Evolution. The four billion year war. Longman.
- Nei, M. & S. Kumar. (2000). Molecular Evolution and Phylogenetics. Oxford University Press.
- Niklas, K.J. (1997). The Evolutionary Biology of Plants. Univ. Chicago P ress.
- Page R.D.M. and Holmes E.C. (1998). Molecular evolution: A phylogenetic approach. Blackwell Science, Oxford.

- Smith, J.M. 1997. Evolutionary Genetics. 2ª edición. Oxford Univ. Press.
- Soler, M. (ed.) 2003. Evolución. La base de la Biología. Proyecto Sur Ediciones.
- Wheeler, Q. & Meier, R. (2000). Species Concepts and Phylogenetic Theory. Columbia University Press.
- Wiens, J.J. (2000). Phylogenic Analysis of Morphological Data. Smithsonian Institution Press.