27117 - Molecular Biology

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	446 - Degree in Biotechnology
ECTS	6.0
Course	3
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

As a mandatory subject, this course is based on previous knowledge adquired in the corses of Chemistry, Genetics, Cellular Biology and Biochemistry.

1.2.Activities and key dates for the course

For students enrolled in the subject, places, times and dates of lectures and practical sessions will be public via Bulletin Board advertisements of the grade on the platform Moodle at the University of Zaragoza , https://moodle2.unizar.es/add/, and in the moodle page for the course. These routes will be also used to communicate enrolled students their distribution by groups of practical sessions, which will be organized by the coordination of degree. Provisional dates will be available on the website of the Faculty of Sciences in the corresponding section of the Degree in Biotechnology : https://ciencias.unizar.es/grado-en-biotecnologia .

In this web there will be also available the dates of exams.

This course is scheduled for the first semester of the academic year. The precise planning of the lessons and exam dates can be found in the School web page at: https://ciencias.unizar.es/grado-en-biotecnologia

The main activities are:

A) Theoretical lessons (4 ECTS) to cover the program detailed in section 5.3. The basic resources to follow the teacher presentations will be provided through the University on-line platform.

B) Seminars (2 ECTS):

In this activity students collect information on a particular topic, aided by the teacher through tutoring sessions. Finally, the works are presented and discussed in class by the student.

27117 - Molecular Biology

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

The final mark in this course will derive from:

a) a written and orally presented work (20% of the final vote) (see activities: "seminars").

b) a writtem exam (80% of the final vote) composed of multiple option questions (25% of this part) and 6-9 short (half a page maximum) open questions covering the main topics developed during the course (75 % of this part).

5.Activities and resources

5.1.General methodological presentation

This course is intended to increase the student's theoretical knowledge through lessons imparted by a specialist teacher and with an active involvement.

5.2.Learning activities

A) Theoretical lessons (4 ECTS) to cover the program detailed in section 5.3. The basic resources to follow the teacher presentations will be provided through the University on-line platform.

B) Seminars (2 ECTS):

In this activity students collect information on a particular topic, aided by the teacher through tutoring sessions. Finally, the works are presented and discussed in class by the student.

27117 - Molecular Biology

The final mark in this course will derive from:

a) a written and orally presented work ("seminars"; 20% of the final vote).

b) a writtem exam (80% of the final vote) composed of multiple option questions (25% of this part) and 6-9 short (half a page maximum) open questions covering the main topics developed during the theoretical lessons (75 % of this part).

5.3.Program

The subject contents will be developed in the following 17 topics:

1. Objectives of the course. B asic structural features of nucleic acids. Structure and organization of the prokaryotic and eukaryotic genomes.
2. DNA replication: basic features of DNA synthesis . P rokaryotIC DNA polymerases. Fidelity polymerases. Origin of replication. The replisomE. Regulation of replication initiation. Termination of replication.
3. Eukaryotic DNA replication. E ukaryotIC DNA polymerases. Histone duplication. Telomeres and Telomerase.
4. Mitochondrial DNA replication.
5. Virus replication. DNA synthesis from RNA. Replicating RNA genomes.
6. DNA repair. Fidelity of replication. Mutations. Repair mechanisms in E. coli. SOS repair. Repair in eukaryotic organisms.
7. Prokaryotic RNA synthesis. Classes of RNAs. RNA synthesis mechanism. RNA polymerases. Promoter. Initiation, elongation and termination of RNA synthesis. Inhibitors of transcription.
8. Prokaryotic RNA processing. Maturation of tRNAs and rRNAs.
9. Synthesis of eukaryotic RNA. RNA polymerases. Promoters. Transcription factors. Synthesis of ribosomal, messengers and transfer RNAs. Expression r egulation of various types of genes. Inhibitors of transcription.
10. P ost-transcriptional m odifications of RNA in eukaryotes. Exons and introns. Processing of ribosomal, messengers and transfer RNA precursors.
11. Mitochondrial RNA s ynthesis and processing. Organization and expression of the mitochondrial DNA of mammals and other animals. RNA processing. Organization and expression of the yeast mitochondrial DNA. Maturases.
12. G enetic code. Deciphering the genetic code. Codon-anticodon recognition. Codon usage. Redundancy of the genetic code. M itochondrial genetic code. Alterations of the genetic code: mutations.
13. General ranslation characteristics.- Protein synthesis machinery . Transfer RNA. Relationship between structure and function of tRNA. Aminoacylation. Aminoacyl tRNA synthetases. Structure of ribosomes. Ribosomes role in protein synthesis. A ctive centers of ribosomes.
14. Protein biosynthesis in procaryotes. Stages of initiation, elongation and termination: Requirements, factors and general translation mechanism. Polyribosomes.
15. Biosynthesis of proteins in eucaryotic cells.- Differential characteristics. Mitochondrial protein synthesis. Translation inhibitors.
16. Regulation of gene expression in prokaryotes. Regulation of initiation factors. Sporulation of Bacillus subtilis. Operon's positive and negative control. Lac operon. Trp operon. Regulation of the life cycle of bacteriophage l.
17. Regulation of gene expression in eucaryotic cells.- General features. Transcription factors. C is regulatory sequences. Response elements. DNA binding domains. Zinc fingers. H omeotic genes. Leucine zippers. Dosage and gene amplification. Regulation of RNA processing. Regulation of translation. P ost-translational regulation.

5.4.Planning and scheduling

This course is scheduled for the first semester of the academic year.

Schedules of lectures and problems will coincide with the officially established and will be available at: https://ciencias.unizar.es/grado-en-biotecnologia .

27117 - Molecular Biology

The places, calendar and groups for training and practical sessions will be established in coordination with the rest of maters at beginning of course. The Coordinator will produce the groups of students for these activities at beginning of course to avoid overlaps with other subjects.

5.5.Bibliography and recomended resources

- Michael M. Cox, Jennifer A. Doudna, Michael O'Donnell. Molecular Biology Principles and Practice. W.H.Freeman, 2011
- Biología molecular del gen / James D. Watson... [et al.] ; . - 5ª ed. Buenos Aires [etc.] : Ed. Médica Panamericana, D.L. 2005
- Molecular biology of the gene / James D. Watson ... [et al.] . 7th edition Boston [etc.] : Pearson : Cold Spring Harbor Laboratory Press, cop. 2014
- Brown, Terry. Introduction to Genetics: A Molecular Approach. Garland Science, 2011
- Clark, David P.. Molecular biology / David P. Clark, Nanette J. Pazdernik . 2nd ed. Amsterdam [etc.] : Elsevier. Academic Press, c2013
- Nelson, David L.. Lehninger Principios de bioquímica / David L. Nelson, Michael M. Cox ; coordinador de la traducción, Claudi M. Cuchillo. 6ª ed. Barcelona : Omega, D.L. 2014
- Molecular biology of the cell : reference edition / Bruce Alberts ... [et al.] ; with problems by John Wilson, Tim Hunt . - 5th ed. New York : Garland Science, 2008
- Introducción a la biología celular / Bruce Alberts ... [et al.] . - 3ª ed. México : Editorial Médica Panamericana, 2011
- Molecular cell biology / Harvey Lodish ... [et al.] . - 6th ed. New York : W. H. Freeman, cop. 2008
- Freifelder, David. Fundamentos de Biología molecular / David Freifelder ; traducido del inglés por Julio Montoya Villarroya . - [1a ed.] Zaragoza : Acribia, imp. 1988
- Kornberg, Arthur. DNA replication / Arthur Kornberg, Tania A. Baker . - 2nd ed. Sausalito, California : University Science Books, cop. 2005
- Singer, Maxine. Genes y Genomas : Genes & Genomes. Omega, 1993
- Stryer, Lubert. Bioquímica : con aplicaciones clínicas / Lubert Stryer, Jeremy M. Berg, John L. Tymoczko ; con la colaboración de Gregory J. Gatto, Jr. ; [versión española por Miguel Ángel Trueba] . 7ª ed. Barcelona [etc.] : Reverté, D.L. 2013
- Cooper, Geoffrey M.. La célula / Geoffrey M. Cooper, Robert E. Hausman. 6ª ed. Madrid : Marbán, cop. 2014
- Nelson, David L.. Principios de bioquímica / David L. Nelson, Michael M. Cox ; coordinador de la traducción, Claudi M. Cuchillo. - 6ª ed. Barcelona : Omega, D.L. 2014
- Tymoczko, John L.. Bioquímica : curso básico / John L. Tymoczko, Jeremy M. Berg, Lubert Stryer ; [versión española traducida por Juan Manuel González Mañas] Barcelona [etc.] : Reverté, D.L. 2014