Universidad Zaragoza

Year : 2020/21

27117 - Molecular Biology

Syllabus Information

Academic Year: 2020/21
Subject: 27117 - Molecular Biology
Faculty / School: 100 - Facultad de Ciencias
Degree: 446 - Degree in Biotechnology
ECTS: 6.0
Year: 3
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.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.

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

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).

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as: Lectures, Seminars, autonomous work and study.

Students are expected to participate actively in class throughout the semester.

Further information regarding the course will be provided on the first day of class.

4.2.Learning tasks

The course includes the following learning tasks:

- Lectures (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 online platform.
- 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.

The final mark in this course will derive from:

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

- *Teaching and assessment activities will take place as usual in presential mode, unless, due to the health situation, the medical authorities and the University decide to recommend or impose on line teaching.*

4.3.Syllabus

The course will address the following topics:

- Topic 1. Objectives of the course. Basic structural features of nucleic acids. Structure and organization of the prokaryotic and eukaryotic genomes.
- Topic 2. DNA replication: basic features of DNA synthesis. ProkaryotIC DNA polymerases. Fidelity polymerases. Origin of replication. The replisomE.Regulation of replication initiation. Termination of replication.
- Topic 3. Eukaryotic DNA replication. EukaryotIC DNA polymerases. Histone duplication. Telomeres and Telomerase.
- Topic 4. Mitochondrial DNA replication.
- Topic 5. Virus replication. DNA synthesis from RNA. Replicating RNA genomes.
- Topic 6. DNA repair. Fidelity of replication. Mutations. Repair mechanisms in E. coli. SOS repair. Repair in eukaryotic organisms.
- Topic 7. Prokaryotic RNA synthesis. Classes of RNAs. RNA synthesis mechanism. RNA polymerases. Promoter. Initiation, elongation and termination of RNA synthesis. Inhibitors of transcription.
- Topic 8. Prokaryotic RNA processing. Maturation of tRNAs and rRNAs.
- Topic 9. Synthesis of eukaryotic RNA. RNA polymerases. Promoters. Transcription factors. Synthesis of ribosomal, messengers and transfer RNAs. Expression regulation of various types of genes. Inhibitors of transcription.
- Topic 10. Post-transcriptional modifications of RNA in eukaryotes. Exons and introns. Processing of ribosomal, messengers and transfer RNA precursors.
- Topic 11. Mitochondrial RNA synthesis 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.
- Topic 12. Genetic code. Deciphering the genetic code. Codon-anticodon recognition. Codon usage. Redundancy of the genetic code. Mitochondrial genetic code. Alterations of the genetic code: mutations.
- Topic 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. Active centers of ribosomes.
- Topic 14. Protein biosynthesis in procaryotes. Stages of initiation, elongation and termination: Requirements, factors and general translation mechanism. Polyribosomes.
- Topic 15. Biosynthesis of proteins in eucaryotic cells.- Differential characteristics. Mitochondrial protein synthesis. Translation inhibitors.
- Topic 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.
- Topic 17. Regulation of gene expression in eucaryotic cells.- General features. Transcription factors. Cis regulatory sequences. Response elements. DNA binding domains. Zinc fingers. Homeotic genes. Leucine zippers. Dosage and gene amplification. Regulation of RNA processing. Regulation of translation. Post-translational regulation.

4.4.Course planning and calendar

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.

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.

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

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=27117&year=2020