UAB
Universitat Autònoma de Barcelona

Molecular Biology

Code: 100858
ECTS Credits: 6

2025/2026

Degree	Type	Year
Biochemistry	OB	2

Contact

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

It is highly recommended have done previously the following subjects: Biochemistry I and II, Cell Biology, Genetics, and Microbiology.

Objectives and Contextualisation

This course will focus on the structure and function of nucleic acids. The detail topics of the course are listed in the contents section. The main objective of this course is that students get knowledge on the fundamentals in chromatin structure, epigenetics, transcription and translation mechanisms in prokaryotic and eukaryotic organisms, and how the DNA is replicated and repaired. Moreover, the experimental foundations on which the different topics are based will be specifically addressed during this course.

Learning Outcomes

1. CM16 (Competence) Assess new methodologies and approaches in molecular biology research applied to the study of cancer.
2. CM18 (Competence) Make an oral presentation on a topic related to molecular biology.
3. KM21 (Knowledge) Describe the molecular mechanisms involved in the maintenance, variability and transmission of genetic information, as well as in the regulation of gene expression.
4. SM18 (Skill) Apply computing resources to visualize and understand the three-dimensional structure of proteins, search for information in databases, and use molecular tools.
5. SM19 (Skill) Analyse the molecular mechanisms that regulate the function of proteins and nucleic acids, as well as their alterations in cancer.

Content

Syllabus:

1. Genes and chromosomes.

DNA size. Supercoiling. Structure of the eukaryotic chromosome: chromatin, histones, nucleosomes. Organization at higher levels. Chromosome maintenance proteins (SMC).

2. The structure of chromatin as a mechanism for controlling gene expression.

Levels of regulation of gene expression. Methods of analysis of differential gene expression. Active chromatin and nuclease sensitivity assay. Modification of histones. Remodelling complexes. Subtypes of histones. DNA methylation

3. Prokaryotic and eukaryotic transcription.

Structure and function of prokaryotic RNA polymerase: Structure and binding to the promoter. Elongation and Termination of transcription. General principles of the regulation of gene expression: positive and negative regulation. Control of transcription in prokaryotes. Eukaryotic RNA polymerases and synthesis of the different RNAs. Other eukaryotic RNAs: miRNA, siRNA, piRNA and lncRNA. The promoter zone of RNA polymerase II and other regulatory elements. Assembly of the transcription machinery. The mediator complex. Characteristics of transcription factors.

4. Processing of eukaryotic mRNA.

Processing at the 5 'end. Splicing Processing at the 3 'end. Alternative splicing. Edition of the RNA. Mechanism of mRNA degradation. P-bodies and stress granules. Regulation of the transport and stability of eukaryotic mRNA.

5. Translation.

The genetic code. Transfer RNA and aminoacylation: Structure of tRNA. Aminoacyl tRNA synthetases. Codon-anticodon interactions. Ribosomes: Structure. Peptide synthesis: initiation, elongation and termination. Control of translation.

6. Replication, repair, recombination and transposition.

Molecular mechanism of DNA replication in prokaryotes. The replisome (helicase, RNA primase, DNA polymerases);ssDNA binding proteins;DNA ligase; topoisomerases. DNA polymerases I and III. Replication of DNA in eukaryotes: cell cycle, mechanism of replication. Reverse transcriptase and telomerase. Repair systems. Homologous DNA recombination. Transposition.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	35	1.4	CM16, KM21, SM19, CM16
Seminar sessions	10	0.4	CM16, CM18, KM21, SM18, SM19, CM16
Type: Supervised			
Preparation and exposition of seminars (in group)	20	0.8	CM16, CM18, KM21, SM18, SM19, CM16
Type: Autonomous			
Study, and research of information.	78	3.12	CM16, KM21, SM18, SM19, CM16

The teaching activities are divided into two sections: lecturer sessions and seminar sessions, each of them with their specific methodology.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assessment of assignments	20%	1	0.04	CM16, CM18, KM21, SM18, SM19
First midterm exam	40%	3	0.12	CM16, KM21, SM19
Second midterm exam	40%	3	0.12	CM16, KM21, SM19

ASSESSMENT
Continuous Assessment
Theory
The total weight of the assessment for the theoretical part will be 80% of the final grade for the course. The main assessment of this part will be carried out through continuous assessment with two midterm exams. Each midterm must be passed with a minimum of 4.0 out of 10. If a score below 4.0 is obtained, the failed midterm(s) can be retaken in the resit exam.
The assessment of the theory section can be retaken as indicated at the end of this section.
Seminars
Seminars will be assessed continuously. The weight of the seminar assessment will be 20% of the total grade, and attendance is mandatory (except in very justified circumstances). Absence will negatively affect the grade. Seminar work must be submitted to the instructor one week before the in-class presentation.
Seminars cannot be retaken.
Overall Assessment
The course will be passed when the sum of the different components, weighted according to their specific value in the course, equals or exceeds 5.0 out of 10 points. Each of the midterms must be passed with at least 40% of the maximum grade in order to add the seminar grade to the overall grade.
To participate in the theory resit, according to UAB regulations, students must have previously been assessed in a set of activities whose weight is at least two-thirds of the total grade for the course or module. Therefore, students will receive the grade "Not Assessable" when the assessment activities completed account for less than 67% of the final grade.
Students who have had toretake the course in the resit exam will not be eligible for the highest grade of "Honors Distinction" but may achieve a maximum grade of "Excellent." It is possible to take the resit exam to improve the grade, but this will mean forfeiting the previous grade, and in this case, the "Honors Distinction" cannot be awarded.
Students who are unable to attend an individual assessment due to a justified reason (such as illness, death of a first-degree relative, or accident, etc.) and provide the corresponding official documentation to the Course Coordinator will have the right to take a make-up exam, which may be oral.
Single Assessment
The single assessment consists of a single exam covering the entire theoretical content of the course. The exam will include essay questions and/or short-answer questions. The grade obtained in this synthesis exam will account for 80% of the final grade. The single assessment exam will take place on the same date scheduled for the second midterm of the continuous assessment, and the same resit system as for the continuous assessment will apply.
The assessment of seminar activities (attendance is not mandatory for students who choose the single assessment format) will follow the same process as in the continuous assessment: students will submit the

assignment (audiovisual file) via the virtual campus on the date announced at the beginning of the course. The grade obtained will represent 20% of the final grade.
The course will be considered passed when the overall grade for theory and seminars exceeds 5.0 out of 10 points. However, a minimum of 4 out of 10 in the theory section is required for it to be averaged with the seminar grade. Otherwise, the course will not be considered passed.
This type of assessment must be requested at the beginning of the course.
Use of Artificial Intelligence (AI) Technologies
For this course, the use of AI is permitted exclusively for support tasks such as bibliographic or information searches, text correction, or translations, always applying a selection criterion that limits it to verified scientific texts (preferably journals indexed in PubMed or Web of Science). It may also be used for image generation or slide design.
Students must clearly identify which parts have been generated with this technology, specify the tools used, and include a critical reflection on how these tools have influenced the process and the final outcome of the activity. Lack of transparency regarding the use of AI in this graded activity will be considered academic dishonesty and may result in a partial or total penalty in the activity's grade, or more severe sanctions in serious cases.

Bibliography

Bibliografia bàsica recomanada
Gene Control
Latchman, D. S., Cheriyath, V.
3rd Edition. Routledge, 2025. ISBN: 9781032465463.
Lehninger. Principles of Biochemistry
Nelson, D. L., Cox, M. M.
8th Edition. W.H. Freeman (Macmillan Learning), 2021.
Molecular Biology
Zlatanova, J.
2nd Edition. Garland Science, 2023.
Biochemistry
Voet, D., Voet, J. G.
5th Edition. John Wiley & Sons Ltd, 2018.
Molecular Biology of the Cell
Alberts, B., Heald, R., Alexander, J., et al.
7th Edition. Norton & Co, 2022.

Review articles and web links available in the slides and/or on the course's Virtual Campus.

Software

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Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn

(PAUL) Classroom practices	321	Spanish	second semester	morning-mixed
(TE) Theory	32	Spanish	second semester	afternoon