STRUCTURAL, EPIGENETIC AND POST-TRANSCRIPTIONAL ALTERATIONS IN CANCER

1.- General information					
Code	303004	Plan		ECTS	3
Type	Elective	Course	2025/2026	Periodicity	1st Semester
Language		Spanish			
Department	Cancer Research Center				
Virtual Platform	https://cicloud.dep.usal.es/				

1.1.- Faculty			
Professor Coordinator	Dr. Mercedes Dosil		
Department	Biochemistry and Molecular Biology		
Research area	Ribosome synthesis in normal and cancer cells		
Center	Cancer Research Center		
Office	Laboratory 3		
Tutorials	Monday to Friday (selected dates) Timing: 9:30 to 11.00		
URL Web	https://www.cicancer.org/grupo?id=44		
E-mail	mdosil@usal.es	Phone	+34 923294500-3015

Professor	Dra. Sandra Blanco Benavente		
Research area	Cancer epitranscriptomics		
Center	Cancer Research Center		
Office	Laboratory 5		
Tutorials	On students demand		
URL Web	https://www.cicancer.org/grupo?id=34		
E-mail	sblanco@usal.es	Phone	+34 923295805

Professor	Dr. José Carlos Reyes		
Research area	Epigenetics and gene expression		
Center	Centro Andaluz de Biología Molecular y Medicina Regenerativa		
URL Web	https://www.cabimer.es/en/research-groups/epigenetics-and-gene-expression/		
E-mail	jose.reyes@cabimer.es	Phone	+34 954 468 004

2.- Previous recommendations

Bachelor's Degree in Biology, Pharmacy, Medicine, Biochemistry, Biomedicine, or Biotechnology.

3.- Aims of the subject

- Know mechanisms of gene expression control other than the regulation of transcriptional factors.
- Know the most recent discoveries in topics of structural genomic variations, epigenetic regulation, regulation by non-coding RNAs and regulation of translation in normal and tumor cells.
- Know molecular events that cause gene expression alterations in transformed cells, and become familiar with the experimental strategies that study their roles in tumors.
- Understand the fundamentals and significance of the techniques to characterize structural variants, epigenetic alterations and translational landscapes in cancer research.
- Know methodologies that allow the modification of protein expression of proteins in cancer cells, in the context of possible therapeutic applications.

4.- Skills to be acquired / Learning outcomes

Skills

4.1: Basic skills:

• Understand advanced topics in Molecular Biology, Cell Biology and Genetics.

• Be able to integrate information from different sources and get to know the current status of a particular area of research.

• Know how to access trustable information and data about specialized research fields.

4.2: Specific skills:

Know the current status, relevance, and experimental approaches used to study a specific cellular process. Identify the main challenges in that particular field of research.

4.3: Transferable skills:

• Apply critical thinking and be able to interpret the value of experimental approaches used in cancer research and the information obtained from them.

• Recognize the relevance that different discoveries have for the advancement of knowledge.

5.- Contents (Syllabus)

Lectures:

Topic 1. Epigenetic mechanisms. Chromatin remodeling, histone modification and DNA methylation. Global genomic maps of chromatin states. Alterations that affect the accessibility of DNA in tumour genomes. Mutations in epigenetic factors with causal roles in cancer. Epigenetic therapies.

Topic 2. Epitranscriptomic mechanisms. Definition of epitranscriptome. Edition of mRNAs. Detection and functions of methylated adenines and cytosines in RNAs. Epitranscriptomic changes in cancer.

Topic 3. Non-coding RNAs with regulatory functions. Synthesis, actions and functional relevance of miRNAs, piRNAs and siRNAs. Functions in epigenetic and transcriptional regulation of long non- coding RNAs. Non-coding RNAs involved in cancer.

Topic 4. Regulation of translation. Translation initiation. Global and specific regulation of translation. Control of protein synthesis by Myc and TOR kinase pathways. Translation deregulation in cancer and ribosomopathies. Ribosome profiling and other techniques to evaluate the translatome.

Scientific talks:
Students will attend to 2-3 talks given by invited specialists in some topic studied in the course.

Seminars:
The scientific articles to be discussed in the seminars will be chosen from a list of articles related to the program topics.

6.- Teaching methodology

The length of the course will be 7-8 weeks. There will be an introductory session with detailed information about classes, seminars and tutorials.

Lectures will take place in a total of 5 two-hour sessions. The sessions will be didactic presentations given by professors of the CIC or by invited professors. They will provide fundamental information on each subject that the student will need to understand the themes discussed in talks and seminars in the following weeks. The lectures on epigenetics will be given by José Carlos Reyes (CABIMER, Sevilla), the epitranscriptomics ones by Sandra Blanco (Cancer Research Center, Salamanca) and the rest of the classes by Mercedes Dosil (Cancer Research Center, Salamanca).

The scientific talks will cover recent research work, of high interest and impact, that will be given by the main author or director of the work.
The students will have to write a report about each scientific talk.

There will be 5-7 two-hour seminar sessions. Each one will include the presentation, analysis and discussion of a scientific article that describes an important discovery and/or novel experimental approach. Each student will be in charge of one oral presentation. At the very beginning of each seminar session the professor will question all students about the contents of the article they are about to discuss.

6.1.- Estimated learning time

		Hours tutored by the teacher		Individual work (hours)	TOTAL HOURS
		Attendance required (hours)	Distance learning (hours)		
Lectures		10		10	20
Practices	- In classroom				
	- In laboratory				
	- In computer classroom				
	- Countryside				
	- Others (specify)				
Seminars		15		35	50
Work presentations and debates					
Tutorials		5			5
Online activities					
Work preparation					
Other activities					
Exams - evaluation					
TOTAL		**30**		**45**	**75**

7.- Materials, other bibliographical, electronic references or any other type of resource

Scientific articles on the topics of the course, published in high-impact journals.

8.- Assessment

The professors will evaluate the acquisition of skills, together with the attitude and active participation in the course activities of the student.

Assessments on the performance of the student
• Aspects to be evaluated in the study of scientific publications: degree of understanding of the work, previous study of the subject and critical reasoning. The answers to written questions and the contributions of the student during the discussion will be evaluated (35% of the final grade). • Aspects to be evaluated in the oral presentation: comprehension of the article, critical discussion, integration with other information given during the course and clarity (35% of the final grade). • Written reports on scientific talks: the evaluated aspects will be the same as in the oral presentation (15% of the final grade). • Aspects considered for evaluation of the participation in lectures and seminars: interest and initiative to discuss topics and articles, and incorporation of information or material to enrich the discussions (15% of the final grade). It will be of high value that the student poses questions to the invited speakers during their talks.

Recommendations
For a good preparation of activities and the correct study of the information, it is recommended that the student starts to work on the them at the beginning of the course.

9.- Weekly Teaching Schedule

The course will be held over a total of 7–8 weeks.
Paper presentations and classes by Sandra Benavente and Mercedes Dosil will take place between 12:00 noon and 2:00 p.m.
Lectures by guest professors will be double sessions and will be held in the morning. There will be no more than 2–3 of these extended sessions per course.
Detailed information about the dates of all activities will be provided at least one week before the course begins.