Course unit name:REGULATION OF MITOSIS, CHECKPOINTS AND CANCER

1.- General information

Code	303015	Plan		ECTS	3
Type	ELECTIVE	Course	202/2022	Periodicity	1st Semester
Department	Cancer Research Center				
Virtual Platform	Platform:	CICLOUD			
	URL de Acces:	http://cicloud.dep.usal.es/index.php/s/Gp0vghR305Y6glo/authenticate			

Faculty

Professor	Dr. María P. Sacristán Martín		
Department	Microbiology and Genetics		
Research area	Cell Division and Genomic Instability		
Center	Cancer Research Center		
Office	Laboratory 8		
Tutorials	To be arranged with the students		
URL Web	https://www.cicancer.org/investigador?id=a309da48-23ea-4d49-b7fb-5452281fb3d3		
E-mail	msacristan@usal.es	Phone	+34 923294808

Professor	Dr. Andrés Avelino Bueno Núñez		
Department	Microbiology and Genetics		
Research area	Cell Division and Genomic Instability		
Center	Cancer Research Center		
Office	Laboratory 8		
Tutorials	To be arranged with the students		
URL Web	https://www.cicancer.org/investigador?id=8e782aa7-f5a9-4ab5-babc-774bbae17cf5		
E-mail	abn@usal.es	Phone	+34 923294805

2.- The course in the context of the Master´s Program

Treaning Module
First module (first semester)

General aim of the subject
Understand how the cell division cycle works and how is regulated. Understand the molecular mechanisms underlying cellular proliferation and how the loss of the cell cycle control leads to tumor transformation of the cells.

Professional specialization
Researchers specialized in molecular mechanisms involved in genomic instability and cancer

3.- Previous recommendations

Degree in Biology, Biochemistry, Biomedicine, Biotechnology, Medicine or Pharmacy

4.- Aims of the subject

- Understand the molecular bases of the cell division cycle and its regulation.
- Know the structural and molecular regulation of mitosis.
- Know the most relevant proteins involved in the maintenance of genomic stability.
- Know the processes that induce alterations in the cell cycle control and, consequently, the development of tumour cells.
- Know the methodology used to study and analyze potential alterations in the cell cycle
- Know the most recent anti-tumor treatment strategies dependent on specific cell cycle molecular targets.
- Be able to read articles in the field of cell cycle and cancer with a critical prespective.

5.- Contents

Lectures:

Topic 1. Introduction to the cell cycle: General concepts. Phases of the cell cycle: G1, S, G2, M. Experimental approaches to study cell cycle *in vivo*. Regulation of the cell cycle: Cdk/Cyclin complexes and other proteins. Regulation of CDK activity.

Topic 2. Molecular mechanisms of DNA replication (S-phase). START point (restriction point). CDK complexes of G1 and S phases. Regulation of the G1/S transition. Basic mechanisms of DNA replication. Checkpoint mechanisms regulating the entry into mitosis.

Topic 3. Structural regulation of mitosis. The mitotic spindle. Mitotic checkpoint and Chromosomal segregation. Cytokinesis

Topic 4. Molecular mechanisms of regulation of mitosis. Early and late phases of mitosis. Mitotic kinases and phosphatases: a fine balancing between phosphorylation and dephosphorylation processes for proper progression through mitosis. Protein degradation processes: the APC/C complex.

Topic 5. Deregulation of the cell cycle in tumor cells. Mitotic kinases and cancer. Mitotic therapeutic targets.

Seminars:
Scientific articles to be presented at the seminars will be chosen from a list of articles related to the program topics (updated each course).

6.- Skills to be acquired

Basic skills
- Capacity for analysis, global visions, synthesis and practical application of knowledge.

Specific skills
- Ability to reflect on the concept of the cell division cycle, the mechanisms by which cancer can develop. - Critical thinking and understanding the importance of multidisciplinary research for the knowledge of cancer. - Capacity for design and execution of experimental strategies. - Critical capacity in the interpretation of scientific works.

Transversal skills
- Communication skills: ability to understand and express orally and in writing. - Ability to find, use and integrate scientific information.

7.- Teaching methodology

The course will be developed through 5 weeks:

- The course will last 10 lectures (sessions of 1.5 hours) where the content of each one of the topics will be exposed in depth. Recommended bibliography will be provided for each topic. It is recommended that the student attend these sessions having previously read the literature. Sessions include constructive discussions, questions and comments from students.

In the first session the approach of the classes, their organization and the link with the seminars will be introduced. Each session will promote the participation of all students and a critical evaluable discussion.

- Seminars: approximately 20 hours. Students will elaborate an oral presentation, based on scientific articles related to the lecture contents. The scientific articles to be treated will be chosen from a list previously provided by the professor. They will include basic literature, key for understanding how cells divide, and the most recent and important scientific contributions to the field.

Seminars will allow the student to learn how to design, analyze and interpret experimental scientific works. Moreover, the student will acquire skills in communicating science.

8.- Estimated learning time

		Hours tutored by the teacher		Individual work (hours)	TOTAL HOURS
		Attendance required (hours)	Distance learning (hours)		
Lectures		15		15	30
Practices	- In classroom				
	- In laboratory				
	- In computer classroom				
	- Countryside				
	- Visualization classroom				
Seminars		20		20	40
Work presentations and debates					
Tutorials		5			5
Online activities					
Work preparation					
Other activities					
Exams - evaluation					
TOTAL		**40**		**35**	**75**

9.- Materials

Books

Other bibliographical, electronic references or any other type of resource
Scientific articles to be marked in class.

10.- Assessment

The tests or exams designed must evaluate whether the described competences have been acquired, therefore, it is recommended that when describing the tests, the competencies and learning outcomes that are evaluated are indicated.

Assessments on the performance of the student
1. Individual oral presentations (seminars). Degree of understanding of the scientific articles, capacity for connecting with the topics presented in the lectures and ability for discussion and synthesis (40%). 2. Written report/discussion on key scientific articles in the field, selected by the professor and offered to the student at the beginning of the course. Degree of understanding of the work, its connection with the topics presented in the lectures and ability for discussion and synthesis (40%). 3. Participation in seminar discussions (20%).

Recommendations
To be discussed with students during the first lecture.