

**CELL CYCLE REGULATION AND CANCER**

1.- General information					
Code	303033	Plan		ECTS	3
Type	Elective	Course	2026/2027	Periodicity	1 <sup>st</sup> Semester
Language		English			
Department	<a href="#">Cancer Research Center</a>				
Virtual Platform	<a href="https://cicloud.dep.usal.es/">https://cicloud.dep.usal.es/</a>				

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

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

Professor	Dra Nuria Ferrándiz-Díaz		
Research area	Mitotic endomembrane and genetic stability		
Center	<a href="#">Cancer Research Center</a>		
Office	Laboratory 4		
Tutorials	To be arranged with the students		
URL Web	<a href="https://www.cicancer.org/grupo?id=88">https://www.cicancer.org/grupo?id=88</a>		
E-mail	<a href="mailto:i_nuria.ferrandiz@usal.es">i_nuria.ferrandiz@usal.es</a>	Phone	+34 923294804

## **2.- Previous recommendations**

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

## **3.- Aims of the subject**

- Understand the molecular bases of the cell division cycle and its regulation.
- Know how DNA replication and mitosis are strictly coordinated.
- 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 tumor 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 analyze scientific articles about cell cycle and cancer with a critical perspective.

## **4.- Skills to be acquired / Learning outcomes**

### **Skills**

#### **4.1: Basic skills:**

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

#### **4.2: 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.

#### **4.3: Transferable skills:**

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

## **5.- Contents (Syllabus)**

### **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 critical proteins. Regulation of the CDK activity. Checkpoints.

**Topic 2.** Genome structure. 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. Specific checkpoints. Cellular responses to DNA damage: DNA damage Tolerance, DNA damage Repair mechanisms.

**Topic 3.** Regulation of mitosis. The G2/M transition: regulation of mitotic CDK complexes. Early and late phases of mitosis. Reversible phosphorylation and protein degradation processes involved in the progression throughout mitosis. Mitotic kinases and phosphatases. The APC/C complex. The mitotic spindle. Mitotic checkpoint. Cytokinesis.

**Topic 4.** Organelles dynamics: from Interphase to Mitosis (Mitochondria, Golgi, Endoplasmic Reticulum, Nuclear Envelope). Regulation, Function and Diseases. Evolution.

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

**Seminars:**

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

**6.- Teaching methodology**

The course will be developed through 5 weeks:

- **Lectures:** 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.

Attendance is mandatory.

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. Attendance is mandatory.

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.

**6.1.- Estimated learning time**

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

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

Scientific articles to be marked in class.

**8.- Assessment**

**8.1: Assessment Criteria:**

**8.2: Assessment Systems:**

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%).

**8.3: General Considerations and Recommendations for Assessment and Resit:**

To be discussed with students during the first lecture.

**9.- Weekly Teaching Schedule**