

Degree programme	Type	Course
Genetics	OP	4

Contact lecturer

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Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

To have basic knowledge on Human Genetics.

In order to be able to attend the laboratory classes, it is necessary that the student shows that he/she has passed the biosafety tests that can be found in Campus Virtual. He/she must know and accept laboratory standards of practice from Faculty of Biosciences.

Objectives

The objectives of the course are to show how the acquisition of somatic mutations contribute to tumor growth and how genetic variations contribute to inherited susceptibility to cancer. Some issues such as genomic instability and the types of functional changes that result in tumor growth are addressed. We also discuss the genetic and epigenetic changes in cancer, from the chromosomal scale up to small mutations, with examples of the most common cancers.

Learning outcomes

- CM21 (Integrate genomic knowledge in the resolution of complex problems of human health, diagnosis and treatment.) Integrate genomic knowledge in the resolution of complex problems of human health, diagnosis and treatment.
- CM22 (Evaluate the scientific validity and ethical-legal implications of genetic testing and advanced therapies.) Evaluate the scientific validity and ethical-legal implications of genetic testing and advanced therapies.

- KM16 (Describe genetic diagnosis and counseling strategies, as well as the basis of chromosomal and molecular alterations relevant to human health.) Describe genetic diagnosis and counseling strategies, as well as the basis of chromosomal and molecular alterations relevant to human health.
- SM19 (Apply molecular, cytogenetic, and computational techniques in genetic diagnosis and human forensic identification.) Apply molecular, cytogenetic, and computational techniques in genetic diagnosis and human forensic identification.
- SM20 (Interpret the genetic basis of human pathologies and the therapeutic response, integrating the gender perspective and bioethical implications. .) Interpret the genetic basis of human pathologies and the therapeutic response, integrating the gender perspective and bioethical implications. .
- SM21 (Prepare reports on scientific advances in diagnosis, genetic counselling and biotechnological therapies based on the literature review.) Prepare reports on scientific advances in diagnosis, genetic counselling and biotechnological therapies based on the literature review.

Contents

1. What is cancer? Types of tumors. Benign and malignant tumors. Incidence and survival.

2. Characteristics of tumor cells. Cell signalling. Cell cycle control. Angiogenesis. Inactivation of senescence. Apoptosis. Invasiveness and metastasis. Tumor microenvironment. Therapeutic targets.

3. Genes and cancer. Epigenetics and cancer. Methylation. Modification of histones. miRNAs. Potential clinical use.

4. Sequencing the cancer genome. Driver and passenger mutations. Number of mutations required. Circo Plots. Pathways with more alterations. Mutations associated with metastasis. Gene expression profiles.

5. Genetic alterations in leukemia and lymphoma.

6. Genetic alterations of the most frequent carcinomas. Lung cancer, colon cancer, breast cancer, bladder cancer, prostate cancer, kidney cancer.

7. New genetic strategies applied to the diagnosis and treatment of cancer. Tumor heterogeneity. Mutational signatures. Screening in colon cancer. Biomarkers

8. Carcinogenesis. Embryonic stem cells (SCS) and cancer stem cells (CSCS). The cancer stem cell hypothesis. Implications in cancer therapy. Implications in the generation of artificial stem cells. Analysis techniques of the CSC and the tumor phenotype.

9. Environmental carcinogenesis. Molecular mechanisms of environmental carcinogenesis. Human carcinogens. Transplacental carcinogens.

10. Familial cancer, DNA repair and cancer predisposition syndromes

11. Genetic strategies to identify cancer susceptibility genes

12. New treatments for tumors with mutations in genes of tumor predisposition. The concept of synthetic lethality

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Personal study	60	2.4	
Theoretical sessions	25	1	
Seminars	15	0.6	
Laboratory exercises	10	0.4	
Preparation of seminar activities	35	1.4	
Tutorials	2	0.08	

The teaching methodology will benefit from the tools provided by the Virtual Campus of the UAB. To achieve the objectives of the subject, three types of learning activities are proposed: theoretical sessions, seminars and laboratory practices.

- Theoretical sessions: The students acquire their own knowledge of the subject attending the classes, complementing them with the personal study. These classes are designed as lecture sessions by the teaching staff but also the active participation of students is encouraged to establish discussions or collective reflections, using Information and Communications Technologies and Learning and Knowing Technologies. In the classes, digital presentations are used to help the understanding of the contents, which are available on the UAB virtual campus.
- Seminars: The knowledge developed in the theory classes and worked in the personal study is applied to the resolution of practical cases, attendance at conferences and the discussion of original research papers published in international journals. Practical cases arise in the form of problems or questions, which are worked on small groups. These type of methodology allow us to reinforce and deepen the topics studied in the theoretical sessions.
- Laboratory practices: The practical laboratory classes are essential for the learning of any knowledge in the field of experimental sciences. In the case of the course of Cancer Genetics, the practical classes have as objective to show to the students some techniques of tumor genome analysis. The learning and understanding of these techniques will allow the acquisition of skills that will be essential for the professional development of students. The attendance to the laboratory sessions is compulsory.

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
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Practical exercises	10%	0	0	CM21, CM22, SM19, SM20, SM21
Seminar reports	30%	0	0	CM21, CM22, KM16, SM19, SM20, SM21
Written test II	30%	1.5	0.06	CM21, KM16, SM19, SM20
Written test I	30%	1.5	0.06	CM21, KM16, SM19, SM20

a) Two written tests: each test is 30% of the final mark. The minimum mark to pass the subject will be 5 in each test.

b) Reports derived from the activities carried out in the seminars: 30% of the final mark. The works can be problems, interpretation of data, bibliographical research, etc. to be proposed by each responsible professor.

c) Questions or report on laboratory practices: 10% of the final mark. The attendance to the laboratory sessions is compulsory.

To be able to pass the subject, the minimum mark is 5. At the end of the course there will be a remedial test for those students who have failed or not attended any of the two written tests. To be eligible for the remedial exam, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course. The student will be graded as "No Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score.

Unique assessment

Students enrolled in the single assessment will have to take the two written tests and hand in the assignments from works performed in the classes on a single date, only for those that are not in group (under the same conditions as students with continuous assessment). The works performed in the classes that are in group will be assessed on the same day that the students with continuous assessment will be assessed. Laboratory classes are of mandatory attendance and will be assessed on the same day that students with continuous assessment. The percentage of each assessment activity will be the same as in continuous assessment. The single assessment test will coincide with the same date fixed in the calendar for the last continuous assessment test and the same recovery system will be applied as for the continuous assessment. The same "No Avaluable" criterion used for continuous assessment will apply.

Use of artificial intelligence

In this subject, the use of Artificial Intelligence (AI) technologies is allowed as an integral part of the development of the work, provided that the final result reflects a significant contribution of the student in the analysis and personal reflection. The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how these have influenced the process and the final result of the activity. The lack of transparency in the use of AI will be considered a lack of academic honesty and may lead to a penalty in the grade of the activity, or greater sanctions in serious cases.

Academic Misconduct

Any irregularity committed during an assessment activity (including academic fraud, plagiarism, or the improper use of AI, unless such use is expressly authorized in the course guide) that may result in a significant alteration of the grade will lead to that assessment being awarded a mark of 0. If the course guide establishes that obtaining a minimum mark in that assessment is an essential requirement for passing the course, or if multiple irregularities occur in the assessment activities of the same course, the final grade for the course will be 0. In addition, disciplinary proceedings may be initiated against any student who commits any of these irregularities.

Bibliography

- Bunz, Fred. (2022). Principles of cancer genetics. (3rd ed.) Springer Naturenz

[Disponible](#) en línea

[Disponible](#) en papel en la biblioteca

- Mucci, Lorelei [y otros]. (2018). Textbook of cancer epidemiology. (3rd ed.) Oxford University Press

[Disponible](#) en papel en la biblioteca

- Thompson, Craig B. [y otros]. (2015). The molecular basis of cancer. (4th ed.) Saunders / Elsevier

[Disponible](#) en papel en la biblioteca

[Disponible](#) en línea

Review articles that will be available in the Virtual Campus of UAB

Software

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE