Course syllabus/Guide for the academic year

Subject	CANCER DIRECTED THERAPIES		
Field	TERAPIAS AVANZADAS		
Module			
Degree	GRADO EN BIOMEDICINA Y TERAPIAS AVANZADAS		
Program	710	**Código**	47922
Teaching period	1º SEMESTER	**Tipo/Carácter**	OB
Level/Cycle	BACHELOR-DEGREE	**Curso**	4º
ECTS Credits	3		
Language of instruction	English		
Responsible instructor(s)	Álvaro Tamayo Velasco		
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Department	Medicina, Dermatología y Toxicología		
Date reviewed by the title committee	4th July 2024		

1. Situation / Purpose of the course

1.1 Contextualization

Integrated into the "Advanced Therapies" module, Cancer Directed Therapies is a clinically oriented subject in the first semester of the fourth year of the Biomedicine and Advanced Therapies degree. It aims to provide students with the necessary knowledge to understand the development and clinical use of new cancer-targeted therapies, which are increasingly focused on personalized and precision medicine.

1.2 Relationship with other subjects

Cancer Directed Therapies closely relates to many other Medical Sciences. Knowledge in general Pathophysiology, Immunology, Genetics, and Pharmacology is essential to ensure a proper understanding of all the course contents. Additionally, there is a close relationship with other subjects within the same module—highlighting Clinical Trials, Gene Therapy, Cell Therapy, Immunotherapy, and Biopharmaceuticals—which will allow for an integrated understanding from the aspects of basic research to the implementation and standardization in clinical practice of new cancer therapies.

1.3 Prerequisites

Basic concepts of general Pathophysiology, Immunology, Genetics, and Pharmacology.

2. Competencies

2.1 General

CG01. Ability to analyze basic problems related to Biomedicine and Advanced Therapies, solve them using the scientific method, and communicate the solutions efficiently.

CG02. Understand the scientific and technical foundations of Biomedicine and Advanced Therapies, facilitating the learning of new methods and technologies, as well as developing versatility to adapt to new situations.

CG05. Acquire, analyze, interpret, and manage information.

CG09. Write, represent, and interpret scientific and technical documentation.

CG10. Develop leadership skills, innovation, and entrepreneurial spirit.

2.2 Specific

CE20. Understand the cellular and molecular bases of neoplastic transformation and tumor progression, the diagnostic and therapeutic implications of these molecular mechanisms, and the experimental approaches used for their study. Be knowledgeable about strategies used in personalized cancer medicine.

CE21. Gain a broad perspective on new personalized therapies. Development, design, and application of these therapies.

CE41. Be aware of the major historical milestones in Biomedicine and Advanced Therapies and their influence on human societies, as well as the most innovative and recent developments in this field.

CE42. Be capable of sufficient communication in English, the universal language for communication and exchange of scientific information.

CE43. Acquire skills that allow for the search and analysis of relevant scientific information. Be capable of interpreting and communicating such information appropriately.

3. Objectives

- Understand the fundamentals of targeted cancer therapies.
- Explore the biological bases of cancer in the context of targeted molecular therapy.
- Comprehend the foundations of different types of targeted antitumor therapies.
- Learn about targeted therapeutic strategies in research.
- Identify functional diagnostic techniques that allow for developing new individualized antitumor drugs.
- Acquire practical knowledge regarding targeted cancer therapies.
- Relate biological knowledge to other disciplines of biomedical interest.
- Connect basic, translational research and directed clinical oncology practice.
- Understand and interpret scientific publications related to the subject.
- Promote teamwork and group learning.

4. Contents and/or thematic blocks

A) THEORETICAL CLASSES (20 hours)

- **Topic 1. Introduction and pathophysiology of cancer.**
  - Concept of "Cancer Directed Therapies".
  - Understanding the pathophysiology of solid and hematological cancers.

- **Topic 2. Antitumor treatment.**
  - Evolution of treatments over time.
  - Principles of chemotherapy and targeted treatment.
  - Side effects of targeted therapies.
  - Advantages and limitations of targeted therapies.

- **Topic 3. Identification of therapeutic targets.**
  - Definitions of biomarker, molecular target, and cellular target.
  - Identifying patients eligible for targeted therapies.
  - Diagnostic methods enabling the use of targeted therapies: flow cytometry, cytogenetics, molecular biology, etc.

- **Topic 4. Monoclonal antibodies (mAbs).**
  - Characteristics of different monoclonal antibodies.
  - Indications in solid and hematological tumors.

- **Topic 5. Immune checkpoint inhibitors (ICIs).**
  - Global mechanism and specific inhibitors.
  - Indications in solid and hematological tumors.

- **Topic 6. Cytokines, immunomodulators (IMiDs) and proteasome inhibitors.**
  - Clinical use of cytokine-based therapeutic strategies.
  - Use of immunomodulators in cancer.
  - Characteristics and indications of proteasome inhibitors.

- **Topic 7. Hormonal therapy.**
  - Features and indications of hormonal therapy in cancer.

- **Topic 8. Kinase inhibitors (KIs).**
  - Function of main kinases (TK, JAK, BTK, etc.)
  - Features and indications of major kinase inhibitors.

- **Topic 9. Other small molecule inhibitors.**
  - Fundamental aspects and clinical use of angiogenesis inhibitors, signal transduction inhibitors, apoptosis inducers, etc.

- **Topic 10. Antibody-drug conjugates (ADCs).**
  - Features of antibodies conjugated with cytotoxic molecules.
  - Clinical use and indications in cancer.

- **Topic 11. Bispecific antibodies (BsAbs).**
  - Mechanism of action of bispecific antibodies.
  - Clinical features, adverse effects.
  - Development of trispecific antibodies.

- **Topic 12. CAR T-cell therapy.**
  - Mechanism of action of cell therapy using CAR cells.
  - Clinical features, adverse effects.
  - Development of new CAR T, CAR NK and allogenic CARs.

- **Topic 13. Oncolytic viruses.**
  - Features and clinical development.
  - Current and future clinical use and indications.

- **Topic 14. Cancer vaccines.**
  - Features and clinical development.
  - Current and future clinical use and indications.

- **Topic 15. Neo-antigens**
  - Understanding tumor-specific antigens (TSAs) and their future use as directed therapy.
  - Introduction to clinical trials and their specific use.

- **Topic 16. Cancer stem cells**
  - Importance of cancer-involved stem cells.
  - Strategies aimed at their treatment.

- **Topic 17. Tumor microenvironment and cancer heterogeneity.**
  - Importance of the tumor microenvironment in treatment resistance.
  - Tumor heterogeneity, immune evasion, clonal selection.
  - Therapies targeted at the tumor microenvironment.

- **Topic 18. ADEPT therapy.**
  - Understanding the Antibody Directed Enzyme Prodrug Therapy (ADEPT) strategy as a treatment in cancer.

- **Topic 19. Gene therapy.**
  - Exploring the possibilities of gene therapy as a treatment in cancer.

- **Topic 20. New functional diagnostic methods.**
  - New diagnostic methods guiding precision and personalized medicine: liquid biopsy and circulating cells, exosomes, miRNAs…
  - Applicability and implementation in clinical practice.

B) SEMINARS AND CLASSROOM PRACTICALS (10 hours)

- **Seminar 1.** Practical case of CAR T-cell Therapy.
- **Seminar 2.** Practical case of BsAbs Antibodies.
- **Seminar 3.** Practical case of KI.
- **Seminar 4.** Practical case of ADCs.
- **Seminar 5.** Combination therapy practical case.
- **Practical Classroom 1.** Presentation of practical case (group 1).
- **Practical Classroom 2.** Presentation of practical case (group 2).
- **Practical Classroom 3.** Presentation of practical case (group 3).
- **Practical Classroom 4.** Presentation of practical case (group 4).
- **Practical Classroom 5.** Presentation of practical case (group 5).

BASIC BIBLIOGRAPHY

- ***Link Leganto: Handbook of Targeted Cancer Therapy and Immunotherapy, 3rd Edition***. Daniel D. Karp, Gerald S. Falchook, JoAnn D. Lim, Jackie Bronicki.

SUPPLEMENTARY BIBLIOGRAPHY

- Updated scientific articles from high-impact journals, reviewed annually.

5. Teaching methods and methodological principles

Lecture. Classes will be held in person according to the scheduled times for the course and in the usual spaces provided by the Faculty of Medicine. In exceptional circumstances, if in-person teaching cannot be conducted, the lectures will be streamed via licensed platforms at the University of Valladolid (such as Collaborate or Teams) during the scheduled times. Slides from the classes will be available on the virtual campus.

Classroom practicals. These consist of in-person sessions supervised by the teaching staff, where students participate in groups to solve real case studies, consolidating the taught material.

Seminars. These sessions are designed to review and clarify certain theoretical aspects that are particularly challenging, thus complementing the content of the lecture classes. They will be conducted through the presentation of clinical cases that reinforce the theoretical content of the lectures.

Tutoring. During tutoring sessions, students can resolve any doubts and engage in learning activities. Tutoring can be individual or in groups and will be conducted in person. In exceptional and justified circumstances, it can be carried out via any of the platforms licensed at the University of Valladolid.

Continuous assessment. Monitoring will be conducted throughout the academic period to optimally fix the acquired knowledge. This will take place during the lectures and seminars.

Flipped classroom. For classroom practicals, 5 groups of students will be formed who will perform a focused review on new antitumor therapies for different tumors through practical cases provided. This will help solidify the knowledge explained in lectures and reinforced in seminars. It also promotes critical reading, scientific information search, teamwork, communication improvement, and the enhancement of the lecture program and its annual adaptation.

6. Student time commitment table for the course

IN-PERSON OR REMOTE IN-PERSON ACTIVITIES(1)	HOURS	NON-PRESENTIAL ACTIVITIES	HOURS
Lectures	20	Autonomous individual work for lectures	35
Seminars	5	Autonomous work for seminars	5
Classroom practicals	5	Autonomous/group work for practicals	5
Total In-Person	**30**	Total Non-Presential	**45**
		TOTAL In-Person + Non-Presential	**75**

(1) Remote In-Person Activity refers to when a group participates synchronously in a videoconference of the class taught by the instructor.

7. Assessment system and characteristics

INSTRUMENT/PROCEDURE	WEIGHT IN FINAL GRADE	OBSERVATIONS
Continuous Assessment: quizzes on lecture content and group work during classroom practicals.	20% (2 points)	
Final Exam: multiple-choice test with four options covering the entire theoretical program, as well as clinical-practical scenarios from seminars and practical classes.	80% (8 points)	Each incorrect answer will deduct 0.33 points.

Final Grade

-The final grade will be calculated by adding the grade from continuous assessment (20% of the total grade: up to 2 points) to the grade from the final exam (80% of the total grade: up to 8 points).

-The sum of these two grades must be 5 out of 10 points or higher to pass the course.

-It is **mandatory to pass the final exam** (obtain 4 out of the maximum 8 points) to add the continuous assessment grade.

GRADING CRITERIA
• **Regular session: Sum of the grades from the table above.** • **Special session(*):** Conducted in the same way as the regular session, but continuous assessment will only be considered if it is favorable.

(*) A special session is understood to be the second examination session.
Article 35.4 of the ROA 35.4: Participation in the special session will not be subject to class attendance or presence in previous tests, except in cases of external practices, laboratories, or other activities whose evaluation would not be possible without having completed the aforementioned tests.
https://secretariageneral.uva.es/wp-content/uploads/VII.2.-Reglamento-de-Ordenacion-Academica.pdf

8. Final considerations