Teaching guide

IDENTIFICATION DETAILS

Degree:	Pharmacy
Scope	Pharmacy
Faculty/School:	Experimental Sciences
Course:	BIOTECHNOLOGY
Type:	Compulsory
ECTS credits:	3
Year:	4
Code:	2544
Teaching period:	Eighth semester
Subject:	Biotechnology
Module:	Biologics
Teaching type:	Classroom-based
Language:	Spanish
Total number of student study hours:	75

SUBJECT DESCRIPTION

The course program addresses the fundamentals and techniques most used in Molecular Biology and Recombinant DNA Technology that are the basis for the development and applications of Biotechnology, as well as the basic aspects of in vitro cell culture and the application of these techniques for the generation of animal models that allow the study of diseases. It is intended that the student acquires sufficient training to understand the methodology currently used in this area and to follow its development in the future.

GOAL

The subject of Biotechnology is intended for students to learn the basic concepts and applications of Biotechnology in the Pharmaceutical Industry. Students should learn general techniques for manipulating genetic material, essential aspects of gene expression and the use of cell cultures and transgenic animals for the production of pharmaceutical products.

PRIOR KNOWLEDGE

Basic knowledge of Genetics and Molecular Biology.

COURSE SYLLABUS

TOPIC 1: INTRODUCTION TO BIOTECHNOLOGY. Definition, conceptual and historical framework. Pharmaceutical biotechnology, social and business dimension. Bioethical aspects.
TOPIC 2: BIOTECHNOLOGICAL DRUGS. Proteins and nucleic acids. Structure, immunogenicity and pharmaceutical management.
TOPIC 3: PRODUCTION OF THERAPEUTIC PROTEINS. UPSTREAM PHASE I. Obtaining the gene of interest. Techniques for the isolation, amplification, purification and manipulation of genetic material.
TOPIC 4: PRODUCTION OF THERAPEUTIC PROTEINS. UPSTREAM PHASE II. Selection of the expression system. Host cell types and vectors. Techniques for introducing exogenous DNA into the host cell.
TOPIC 5: CELL CULTURES AND BIOREACTORS. Growth phases, types and characteristics of cell cultures. Types and characteristics of industrial bioreactors.
TOPIC 6: PRODUCTION OF THERAPEUTIC PROTEINS. DOWNSTREAM PHASE. Protein purification and analysis techniques.

EDUCATION ACTIVITIES

Face-to-face classroom work activities (AFP):

AFP1. Theory classes: The topics proposed in the theoretical syllabus will be addressed, using audiovisual media. Student discussion and participation will be induced to facilitate their assimilation and learning. The graphic material used in the classroom, as well as complementary material, will be made available to students, through the Virtual Classroom.
AFP2. Exercise classes and problems: The theoretical content will be accompanied by activities and exercises that will be carried out in the classroom and that students will have to present or hand over to the teacher.
AFP3. Seminars and/or exhibition of works: Students will prepare individual or group works, under the supervision of the teacher, which they will present in writing and/or through an oral presentation.
AFP4. Tutoring: Tutoring will serve to clarify doubts and detect imbalances in the achievement of learning. They will review the main difficulties in the development of the subject's syllabus, and the progress made in the acquisition of knowledge and competencies by students will be analyzed in an open discussion. The tutoring schedule can be consulted in the degree coordinator and will be informed by the teacher at the beginning of the course.

AFP5. Examination: The evaluation of the acquisition of competencies will be carried out through written or oral tests.

Non-face-to-face activities (AFNP) that the student must carry out autonomously:

AFNP1. Study of theory, exercises and problems.
AFNP2. Preparation of works.
AFNP3. Tutoring preparation.

DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
34 Horas	41 Horas

Cross Skills

To nurture an attitude of intellectual curiosity and a quest for truth in all areas of life.

To be able to approach a subject by means of rigorous, profound and comprehensive thought.

To be able to assess knowledge acquired.

To be able to apply the theoretical knowledge learnt in the of solving problems and practical cases linked to the various subjects.

LEARNING RESULTS

Develop skills to identify therapeutic targets and biotechnological drug production, as well as for the use of gene therapy.

SPECIFIC LEARNING RESULTS

Describe the basic concepts of Biotechnology applications in Pharmacy.

Explain the fundamentals of the transfer of genetic material to both eukaryotic and prokaryotic cells.

Evaluate general techniques for manipulating genetic material and mutagenesis, as well as the essential aspects of gene expression.

List the main microorganisms used in Biotechnology, as well as interpret the essential methods in the

biotechnological production of all types of products of pharmaceutical interest, mainly polysaccharides, vaccines, antibiotics and proteins.

Explain the use of immobilized enzymes, cell cultures, transgenic animals and knock-out.

LEARNING APPRAISAL SYSTEM

REGULAR EVALUATION SYSTEM
This is the priority evaluation system for the subject. This system is based on continuous evaluation, taking into account that attendance at all classes, regardless of their nature, is mandatory.

ISE1. WRITTEN THEORETICAL EXAM (65% OF THE FINAL GRADE): The acquisition of knowledge about the applications of Biotechnology in the Pharmaceutical Industry will be evaluated, as well as the understanding and knowledge of the general techniques of genetic manipulation, protein expression, use of enzymes, generation and application of transgenic animals and cell cultures through a written test. An exam will be carried out with test-type questions and short questions, based on the content of the theoretical classes.
IF 2. DAILY ACTIVITIES AND TASKS (10% OF THE FINAL GRADE): The daily activities carried out both in the classroom and those carried out by the student autonomously, will be evaluated to monitor the development of learning skills.
IF 3. INDIVIDUAL/GROUP WORK (20% OF THE FINAL GRADE): Knowledge of the main microorganisms used in Biotechnology, as well as their manipulation for the production of products of pharmaceutical interest, the techniques of purification and analysis of the product, will be evaluated by carrying out works that will be presented in written or oral form.
IF 4. ATTENDANCE AND ATTITUDE (5% OF THE FINAL GRADE): Attendance, punctuality, relevant attitude and participation in classroom activities will be positively evaluated.

In order for the grades obtained in the written exam and the work to be taken into account when calculating the final grade, each of the parts must be passed with a score equal to or greater than 5.00 points out of 10.00. Students who obtain a score lower than 5.00 points in any of these parts must enter the extraordinary call to pass the part or parts not passed.
ALTERNATIVE EVALUATION SYSTEM
Students in second or subsequent enrollment must contact the teacher to request to take advantage of this evaluation system, which consists of:

WRITTEN THEORETICAL EXAM (65% OF THE FINAL GRADE): An exam will be carried out with test-type questions and short questions, based on the theoretical content of the subject. To pass the course, it will be necessary to obtain a minimum grade of 5.00 out of 10.00. It will be held on the date established for the examination of the Ordinary Call.
DAILY ACTIVITIES AND TASKS (10% OF THE FINAL GRADE): The content will be the same as that of the students in the first call. The delivery date will be adapted to the needs of students in second enrollment.
INDIVIDUAL/GROUP WORK (25% OF THE FINAL GRADE): The content will be the same as that of the students in the first call. It will be carried out on the dates established for the Ordinary Call works.

IMPORTANT NOTE: Plagiarism, as well as the use of illegitimate means in evaluation tests, will be sanctioned in accordance with those established in the Evaluation Regulations and the University's Coexistence Regulations.

ETHICAL AND RESPONSIBLE USE OF ARTIFICIAL INTELLIGENCE

1.- The use of any Artificial Intelligence (AI) system or service shall be determined by the lecturer, and may only be used in the manner and under the conditions indicated by them. In all cases, its use must comply with the following principles:
a) The use of AI systems or services must be accompanied by critical reflection on the part of the student regarding their impact and/or limitations in the development of the assigned task or project.
b) The selection of AI systems or services must be justified, explaining their advantages over other tools or methods of obtaining information. The chosen model and the version of AI used must be described in as much detail as possible.
c) The student must appropriately cite the use of AI systems or services, specifying the parts of the work where they were used and describing the creative process followed. The use of citation formats and usage examples may be consulted on the Library website(https://www.ufv.es/gestion-de-la-informacion_biblioteca/).
d) The results obtained through AI systems or services must always be verified. As the author, the student is responsible for their work and for the legitimacy of the sources used.
2.- In all cases, the use of AI systems or services must always respect the principles of responsible and ethical use upheld by the university, as outlined in the Guide for the Responsible Use of Artificial Intelligence in Studies at UFV. Additionally, the lecturer may request other types of individual commitments from the student when deemed necessary.
3.- Without prejudice to the above, in cases of doubt regarding the ethical and responsible use of any AI system or service, the lecturer may require an oral presentation of any assignment or partial submission. This oral evaluation shall take precedence over any other form of assessment outlined in the Teaching Guide. In this oral defense, the student must demonstrate knowledge of the subject, justify their decisions, and explain the development of their work.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

T.A. Brown. Gene Cloning and DNA Analysis: An Introduction/7th ed. Oxford: Wilwy Blackwell, 2016.

VVAA.; Humberto Martín Brieva coord. Fundamentals of Pharmaceutical Biotechnology/Madrid:Dextra, 2018.

Additional

Bernard R. Glick, Cheryl L. Patten. Molecular Biotechnology: Principles and Applications of Recombinant DNA/5th ed. Washington:ASM Press, 2017.
(Bernard R. Glick, Cheryl L. Patten. Molecular Biotechnology: Principles and Applications of Recombinant DNA/5th ed. Washington:ASM Press, 2017. , ||Bruce Alberts... [et al.]; With problems by John Wilson, Tim Hunt. Molecular biology of the cell/New York: Garland Science, 2014)