Teaching guide

IDENTIFICATION DETAILS

Degree:	Biotechnology
Scope	Biology and Genetics
Faculty/School:	Experimental Sciences
Course:	BASIC GENETICS
Type:	Compulsory
ECTS credits:	6
Year:	2
Code:	2022
Teaching period:	Third semester
Subject:	Genetics
Module:	Biochemistry and Molecular Biology
Teaching type:	Classroom-based
Language:	Spanish
Total number of student study hours:	150

SUBJECT DESCRIPTION

In the subject of Basic Genetics, we will study the mechanisms of determination, transmission and variation of characters. This study will be carried out in model organisms and in humans, as well as at the individual and population levels.

The field of work of Genetics is the study of the nature, organization, expression, transmission and variation of genetic material, the information that specifies the characteristics of the organism. Current Biotechnology is based on the scientific progress generated and experienced by Genetics in the fields of molecular biology, recombinant DNA technology and genomics. This technology has made it possible to identify, modify and transfer genetic material between organisms, in order to modify 'ad hoc' certain characteristics of living beings. In addition, knowledge of the variability of individual genomes is the basis for personalized diagnosis in diseases as common

as cancer or cardiovascular diseases.
Biotechnology requires professionals with comprehensive training, experts in their area of knowledge, and with a deep knowledge of the meaning and foundation of human dignity, to always seek truth and good, at the service of society and in defense of human rights. In this path, the student will work on the contents through the search and analysis of information, solving problems and questions, and laboratory sessions. The teacher will serve, primarily, as a guide or tutor for these activities. Genetic analysis is not simple, nor is the interpretation of molecular data and processes; but nothing that is truly worthwhile is. Continued work on the subject will allow students to acquire the necessary knowledge, skills and attitudes, not only to pass the subject, but also essential in a university.

GOAL

Relate the information present in the genetic material of an organism to its anatomical, physiological or behavioral characteristics, as well as the possibilities that a professional in the area of Biotechnology has at his disposal to work for the benefit of the progress and good of society, with the comprehensive training provided by the UFV.

The specific aims of the subject are:

FAITH1. Differentiate the different components of the genome of prokaryotic and eukaryotic cells and their organization.

FE2. Interpret the basic processes that lead to the replication and expression of genetic material.

FE3. Relate these processes to the variability of genetic material between individuals and their relationship with human pathologies.

FE4. Distinguish the changes in genetic material that can cause diseases and their mode of inheritance.

FE5. Study the fundamental patterns of inheritance in humans and in model organisms.

PRIOR KNOWLEDGE

Contents of Cell Biology and Fundamentals of Biochemistry, 1st grade.

COURSE SYLLABUS

Topic 1. Basic concepts of classical genetics: gene, locus, alleles, Mendelian inheritance patterns, homologous chromosomes, haploidy and diploidy, mitosis, meiosis, probability in genetics. Inheritance patterns in humans: monogenic diseases, autosomal recessive inheritance, autosomal dominant inheritance.
Theme 2. Deviations from Mendelian segregations. Incomplete dominance and codominance. Multiple alleles. Lethal genes. Pleiotropy. Gene interaction. Penetrance and expressiveness. Sex-linked inheritance. Gene

imprinting. Mitochondrial inheritance.
Theme 3. Ligation and recombination in eukaryotes. Link versus independent transmission. Ligation maps with two or three loci. Linkage analysis in humans: The example of the NCBI Genes and diseases site.
Topic 4. Basic concepts of molecular genetics (I): Organization of the genome. Structure, properties and organization of genetic material.
Topic 5. Basic concepts of molecular genetics (II). Replication of genetic material.
Theme 6. Basic concepts of molecular genetics (III): Expression of genetic material. Transcription and translation. Regulation of gene expression.
Topic 7. Basic concepts of molecular genetics (IV): Genetic variability. Polymorphisms: VNTRs, SNP's, CNVs. Gene mutation. Transposons. Structural and numerical chromosomal alterations: aneuploidies, deletions, duplications, Robertsonian and reciprocal translocations. Uniparental disomy.
Topic 8. Genetic diagnostic techniques. G. FISH Bandeo. PCR and QF-PCR. MAP. Array-CGH. Sequencing.
Practices in experimental laboratory: study techniques will be applied in classical and molecular genetics.

EDUCATION ACTIVITIES

The classes of the course of Basic Genetics will make use of various methodologies in order to achieve the proposed objectives, such as master classes, flipped classroom, collaborative work, resolution of practical cases, exhibitions. The training activities may be carried out both in Spanish and in English.
THE TEACHERS OF THE SUBJECT DO NOT AUTHORIZE THE PUBLICATION BY THE STUDENT OF THE MATERIAL PROVIDED BY THE TEACHERS OF THE SUBJECT IN THE VIRTUAL CLASSROOM, OR BY ANY OTHER MEANS.
Training activities are based on student work and participation. Thus, the master classes given by the teacher lose weight in favor of solving practical cases. The teacher will tutor this work through ordinary teaching sessions and individual or group tutoring:
In more detail, the various teaching activities will consist of:
AF1. Participatory exhibition classes. The theoretical classes will be expository in which the topics will be presented synoptically, using different teaching resources. They may be taught by the teacher, a guest teacher, or some specific topics may be prepared by the students. Positive participation will be encouraged, jointly resolving any doubts that arise, with an active search for information. The teacher will provide the students with the presentations in electronic format to facilitate their study, before or after class.
AF2-I: Practical classes: exercises, case studies. Resolution of practical cases and problems: students will have at their disposal cases or practical exercises related to the contents for resolution in person or not in person. Practical classes will require prior knowledge of the contents necessary for their development; these may have been worked on in an expository class, in videos prepared by the teacher or by studying in the textbooks recommended in the subject's bibliography. It also includes the use of specific computer tools that, depending on access, will be carried out in computer laboratories, or in the classroom.
AF2-II: Practical classes: experimental work carried out in the laboratory. Carrying out real experiments in the teaching laboratory where techniques and knowledge related to the contents of the subject are applied.
AF3: Seminars, round tables, workshops, tutorials, debates, etc. Through tutoring, the teacher, at the request of the student and at the established time for this purpose, will answer questions or discuss the questions posed by the student, in order to guide him in learning the subject.
AF5: Evaluation. Formal evaluation of students through questionnaires, exercise resolution, tests, work evaluations, etc., and official exams.
AF6: Autonomous study: theoretical study and preparation of face-to-face activities. Virtual networking. This activity includes all the student's independent work necessary for learning the subject, such as theoretical study,

exercise resolution, preparation of face-to-face activities, preparation of work, and the work they do as a team in a virtual network, synchronously or asynchronously.

DISTRIBUTION OF WORK TIME

TEACHER-LED TRAINING ACTIVITIES	INDIVIDUAL WORK
65 Horas	85 Horas

SKILLS

Basic Skills

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study.

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

To have acquired the ability for analytical, synthetic, reflective, critical, theoretical and practical thought.

To develop an ability to search for, take in, analyze, sum up and relate information.

To be familiar with the basic principles and theories of human and experimental sciences.

To develop oral and written communication skills.

To acquire the skills needed for experimental work: design, preparation, the compilation of results and the obtainment of conclusions, understanding the limitations of an experimental approach.

General Skills

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To develop oral and written communication skills.

To acquire the skills needed for experimental work: design, preparation, the compilation of results and the obtainment of conclusions, understanding the limitations of an experimental approach.

Specific skills

Know and understand the fundamental principles of Mendelian genetics.

Know and describe the molecular mechanisms that regulate DNA replication and repair, the transcription and processing of sRNAs, and the translation of mRNA.

Identify the structure and describe the nature, organization and function of genetic material at the molecular level in eukaryotic and prokaryotic organisms.

Work properly in a laboratory with biological material (bacteria, fungi, viruses, animal and plant cells, plants and animals) including safety, handling and disposal of biological waste.

Organize and plan the work in the laboratory correctly.

Know how to apply the theoretical knowledge acquired to solving problems and practical cases related to different subjects.

LEARNING RESULTS

It determines inheritance patterns through genetic analysis in model animals and in humans.

Establishes the relative location of different loci by means of linkage analysis in model animals and in humans.

Identifies the major components of the organization of a gene and a genome.

Locate genes of interest in the genome, using genomic browsers.

Explain the basics of DNA replication.

Explain the fundamentals of DNA transcription

Explain the fundamentals of DNA translation

Interpret the results of cytogenetic and molecular diagnostic tests.

LEARNING APPRAISAL SYSTEM

The students' learning outcomes will be evaluated using a varied methodology, taking into account the different activities carried out during the course:
Exam (60%): written test consisting of problems and questions. It includes the contents worked on in the practical classes.
Tasks (25%): case studies, issues or problems
Practical work (15%): preparation of a report with the resolution of the issues raised. Attendance at practice sessions is mandatory, so missing or late practice sessions will be a sufficient reason to suspend internships.
The material provided will take into account: a) the vocabulary property, b) syntactic correction, c) spelling correction (spellings and accents), d) appropriate punctuation, e) adequate presentation. Repeated incorrections will have a negative impact on the note.
To pass the course, you must have a weighted average, between the different evaluation activities, equal to or greater than 5 points out of 10. The weighted average will not be taken if in any of the evaluation activities (exam, practices or tasks) the grade is lower than 5 points out of 10, and the subject will be suspended in that case. The parts passed in the ordinary call will be saved for the extraordinary call. In this call, the student will submit the work required by the teacher or take a test related to the subject that has been suspended. The student who has suspended the internship due to their absence will take a practical exam, in the laboratory, which he will have to pass to pass the subject.
The alternative evaluation system, for students who enroll for the second or more times in the subject, will be the same as for first-time students, although they must contact the teacher of the subject to request to take advantage of this system. The tasks must be carried out within the same time frame that is required of first-time students. The opening and closing of the tasks will be announced by the CANVAS platform so that, even if they cannot attend classes, they are informed. Those students who have passed the internships in previous calls will not have to complete them or submit the report, but this does not exempt the student from mastering the content related to them.
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

Klug, William S. Concepts of genetics/6th ed. New Jersey: Prentice Hall, cop. 2000.

Pierce, Benjamin A. Genetics: a conceptual approach/7th ed. New York: Macmillan Learning, 2020.

Anthony J. F. Griffiths... [et al.]. Introduction to genetic analysis/12th ed.

Additional

Tom Strachan, Andrew P. Read. Human molecular genetics 5th ed.
(Tom Strachan, Andrew P. Read. Human molecular genetics 5th ed. , Boca Raton (FL) :CRC,2019||Tom Strachan, Judith Goodship, Patrick Chinnery. Genetics and Genomics in Medicine)