Teaching Guide				
Identifying Data				2023/24
Subject (*)	Cytogenetics		Code	610G02022
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Fourth	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Gonzalez Tizon, Ana Maria	E-mail	ana.gonzalez.tizon@udc.es	
Lecturers	, Gonzalez Tizon, Ana Maria Martinez Lage, Andres	E-mail	natalia.mallo@udc.es ana.gonzalez.tizon@udc.es andres.martinez@udc.es	
Web				
General description	This is a course focusing on the study of eukaryotic chromosome from the structural, functional and evolutionary perspective. In this area seek to improve the knowledge acquired in the molecular genetics and genetic materials. Special emphasis on the organization of the genetic material and their implications in the evolution of genomes, their variation and handling will be done.			

Study programme competences	
Code	Study programme competences
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A2	Identificar organismos.
A11	Identificar e analizar material de orixe biolóxica e as súas anomalías.
A16	Realizar cultivos celulares e de tecidos.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B5	Traballar en colaboración.
B6	Organizar e planificar o traballo.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.
B10	Exercer a crítica científica.
B11	Debater en público.
B13	Comportarse con ética e responsabilidade social como cidadán e como profesional.

Learning outcomes	
Learning outcomes	Study programme competences

Deepen your knowledge of the organization of hereditary material with an evolutionary approach through the study of chromosomes and their variations.	A1 A11 A16 A26 A30 A31	B1 B2 B3 B5 B6 B8 B9 B10 B11	
Deepen your knowledge of the organization of hereditary material with an evolutionary approach through the study of chromosomes and their variations.	A1 A2 A11 A16 A30 A31	B1 B2 B3 B5 B6 B10 B11	
To understand the fundamentals involve when learning about chromosome and familiar with the basic methodology employed for the study of chromosomes. Tools for cytogenetics.	A1 A2 A11 A16 A30 A31	B1 B2 B3 B5 B6 B11 B13	
To understand the fundamentals involve when learning about chromosome and familiar with the basic methodology employed for the study of chromosomes. Tools for cytogenetics.	A1 A2 A11 A16 A30 A31	B1 B2 B3 B5 B6 B11 B13	
Search and use of different literature and databases that allow carrying out the scientific approach to a topic related to chromosomes sources, organization, function and evolution. Management information sources of interest in cytogenetics.	A29	B1 B2 B3 B5 B6 B11 B13	

Contents	
Topic	**Sub-topic**
Topic 1. Organization and structure of the eukaryotic chromosome	O DNA no cromosoma: DNA de copia única, DNA moderadamente repetitivo, DNA altamente repetitivo, secuencias esenciales: CEN, TEL e ARS. A proteínas cromosómicas: histonas e non histonas. Tipos, modificacións e funcións.

Topic 2. From chromatin to metaphase chromosome	Organización da cromatina en interfase: o nucleosoma, a fibra fundamental, os bucles e as SARs. Os territorios cromosómicos. Organización do cromosoma en metafase: condensinas e andamio de proteínas non histónicas. Tipos de cromatina. O cariotipo.
Topic 3. The longitudinal differentiation of chromosomes	O bandeo de cromosomas. Tipos de bandas. Significado estructural e funcional das bandas. As isocoras.
Topic 4. Chromosome replication and trancription	Ciclo celular e replicación. Replicación da cromatina e acoplamento das histonas. A transcripción da fibra de cromatina: eucromatina e heterocromatina. Os cromosomas plumosos e os cromosomas politénicos.
Topic 5. Mitosis and changes in cell division	Características principais da mitosis Intercambio entre cromátidas Control da separación de cromátidas irmáns
Topic 6. Meiosis and changes of chromosome behaviour	Caracterísiticas principais da meiosis Complexos sinaptonémicos Recombinación e nódulos de recombinación Os quiasmas: frecuencia e distribución Segregación cromosómica e cromatídica
Topic 7. Chromosome sex determination	Sistemas cromosómicos de determinación do sexo A haplodiploidía. Heterocromatinización e sexo. Orixen dos cromosomas sexuais
Topic 8. Structural chromosome changes	Delecions: clases e orixen. Consecuencias xenéticas Duplicacions: clases, oricen, consecuencias e relevancia no proceso evolutivo. Inversions: clases, orixen, comportamento meiótico, consecuencias e relevancia no proceso evolutivo. Translocacions: clases, orixen, comportamento meiótico, consecuencias e relevancia no proceso evolutivo.
Topic 9. Poliploydy, haplodiploydy and anepuloydy	Orixen, identificación, tipos, comportamento meiótico, consecuencias, e importancia evolutiva. Os cromosomas B Amplificación xénica
Topic 10. Methodologies and development of technologies	Hibridación in situ fluorescente. Cariotipos espectrales. Citometría de fluxo. Microdisección e microclonación de cromosomas ou bandas cromosómicas.
Laboratory practices	1. Cultivos celulares e obtención de cromosomas metafásicos 2. Inducción de bandas cromosómicas e estudo da actividade NOR 3. Elaboración de cariotipos

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours

Guest lecture / keynote speech	A1 A2 A11 A16 A26 A29 A30 A31 B1 B2 B3 B5 B6 B8 B9 B10 B11 B13	21	52.5	73.5
Laboratory practice	A1 A2 A11 A16 A31 B1 B2 B3 B5 B6 B13	14	28	42
Mixed objective/subjective test	B1 B2 B8 B9 B13	1.5	0	1.5
Workbook	A26 B1 B2 B5 B6 B8 B13	0	6	6
Practical test:	B1 B2 B13	1	0	1
Oral presentation	A29 B1 B3 B8 B9 B11 B13	5	17	22
Personalized attention		4	0	4
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	In the lectures, the lecturers will explain the fundamental contents of each subject of the programme and will indicate the associated activities. These will include bibliographic consultation, the resolution of question and problem papers, or the elaboration of a work to be carried out by the student in a group or individually.
Laboratory practice	The practical classes will comprise an explanation by the lecturers of the conceptual basis, the objectives to be achieved, the development of tasks by the student, following a previously provided script. The aim is for the student to have maximum autonomy, providing him with the means and guidance.
Mixed objective/subjective test	The mixed test will consist of short questions or test-type questions and resolution of exercises and problems.
Workbook	The student will read one or two scientific articles to deepen the contents of the syllabus, and will present them orally.
Practical test:	The knowledge acquired during the laboratory practicals will be assessed.
Oral presentation	It will consist of the presentation of one or two scientific articles, accompanied by a power point presentation, which will later be hosted on the Moodle platform of the subject for consultation by the rest of the students in order to complete the contents of the subject. The presentation will last 10-12 minutes. This activity will be carried out in pairs and both members of the group will share the presentation of the work.

Personalized attention	
Methodologies	**Description**
Practical test: Workbook Laboratory practice Oral presentation Guest lecture / keynote speech	Throughout the course, the teacher will be available during the hours of interactive lectures, group tutorials / small group and individual tutoring for answering questions, guiding the development of seminars / group work and all matters related to the organization of matter.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Practical test:	B1 B2 B13	Se valorará os conocimientos adquiridos durante as prácticas de laboratorio.	15
Laboratory practice	A1 A2 A11 A16 A31 B1 B2 B3 B5 B6 B13	Take into account the interest to learn techniques on chromosomes, skill in the laboratory experiments ability to solve chromosomes and the attitude and ability to function in the laboratory.	20

Mixed objective/subjective test	B1 B2 B8 B9 B13	Avaliarase mediante unha proba obxectiva os coñecementos adquiridos durante as clases expositivas e as clases en grupo interactivo.	40
Oral presentation	A29 B1 B3 B8 B9 B11 B13	Avaliarase a exposición oral e a presentación en power point do traballo realizado polo alumno tendo en conta a capacidade para extraer o más relevante dos artículos científicos empregados, a capacidade de traballar en grupo, a expresión oral e corporal, e a capacidade de síntese.	25

Assessment comments
Laboratory practices are mandatory. It will be considered NOT PRESENTED when the student has not participated in more than 20% of the scheduled assessable activities. This criterion applies to the January call. In the July call, to obtain the grade NOT PRESENTED, it will be enough to not appear for the objective tests (theory and practical exams). For the evaluation of the July call, the student, in addition to the theory and practical exams, must present the bulletins of solved problems and the power point presentation of the oral presentation. In the event that these last two activities were already evaluated in the January call, the grade obtained will remain for July. For students with part-time dedication and exemption from attendance, the teacher will adopt the measures that he deems appropriate to avoid damaging her grade (flexibility in the delivery dates of the assessable activities). Instead of the oral presentation, these students will make a 2-3 page summary that must be delivered in pdf to the teacher for evaluation. The fraudulent performance of tests or assessment activities will directly imply the application of current regulations in the UDC.

Sources of information	
Basic	- Pierce BA (2011). Fundamentos de Genética, conceptos y relaciones. Buenos Aires, Médica Panamericana - Klug WS, Cummings MR (2011). Essentials of Genetics. San Francisco, Pearson - Pierce BA (2008). Genetics, a conceptual approach. New York, Freeman Nesta materia, os profesores recomendarán artículos científicos de revisión, publicados recentemente, para que o alumnado dispoña de bibliografía e referencias actuais sobre cada un dos temas da materia.Os artículos estarán aloxados na plataforma moodle dende o primeiro día de clase.
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Biology: Basic Levels of Organisation of Life I (Cells)/610G02007 Genetics/610G02019 Molecular Genetics/610G02020
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

Attendance at lectures makes it possible to deal with any doubts or
questions that may arise in the course of the explanations, facilitating
the understanding of the subjects. Study should include regular reading
of at least the recommended bibliography. Group study and work favours
understanding and develops a critical spirit. The doubts and
difficulties that arise in any aspect of the subject will be resolved as
soon as possible, raising them in the classroom or attending individual
tutorials. Given that part of the recommended bibliography for this
subject is in English, it is recommended to have a good command of this
language, at least at the level of comprehension of written texts.Gender PerspectiveIn
this subject, the gender perspective will be taken into account, sexist
attitudes will not be tolerated and the values of respect and equality
will be promoted.Program Green Campus
Empower of SciencesTo help to achieve some sustainable immediate surroundings
and fulfil with the point 6 of the Environmental Statement of the faculty of
Sciences (2020), the documentary works that realise in this matter:to. They will request
mostly in virtual format and computer supportb. To realise in
paper:-they will not employ
plastic-will realise
impressions to double expensive-will employ paper
recycled-will avoid the
realisation of draftsTo Environmental Statement is available
in:https://ciencias.udc.es/images/Facultade/Green_Campus/Regulamento_Comit%C3%A9_Green_Campus_FCiencias.pdf