



## Teaching Guide

| Teaching Guide           |  |        |   |           |
|--------------------------|--|--------|---|-----------|
| Identifying Data         |  |        | 2023/24   |           |
| Subject (*)              | Molecular Techniques   | Code   |   | 610441002 |
| Study programme          | Máster Universitario en Bioloxía Molecular, Celular e Xenética   |        |   |           |
| Descriptors              |  |        |   |           |
| Cycle                    | Period   | Year   | Type  | Credits   |
| Official Master's Degree | 1st four-month period  | First  | Obligatory  | 6         |
| Language                 | SpanishGalicianEnglish   |        |   |           |
| Teaching method          | Face-to-face   |        |   |           |
| Prerequisites            |  |        |   |           |
| Department               | BioloxíaDepartamento profesorado máster  |        |   |           |
| Coordinador              | Lamas Maceiras, Mónica   | E-mail | monica.lamas@udc.es   |           |
| Lecturers                | Carrillo Barral, Néstor<br>Lamas Maceiras, Mónica<br>Martinez Martinez, M. Luisa<br>Pomar Barbeito, Federico<br>Vizoso Vázquez, Ángel José | E-mail | n.carrillo@udc.es<br>monica.lamas@udc.es<br>m.l.martinez@udc.es<br>federico.pomar@udc.es<br>a.vizoso@udc.es |           |
| Web                      | ciencias.udc.es/masters-bcm/master-en-biología-molecular-y-celula  |        |   |           |
| General description      | Molecular Techniques used in Molecular and Cell Biology, and other related subjects.   |        |   |           |

## Study programme competences

| Code | Study programme competences  |
|------|--|
| A1   | Skills of working in a sure way in the laboratories knowing operation handbooks and actions to avoid incidents of risk.  |
| A2   | Skills of using usual techniques and instruments in the cellular, biological and molecular research: that are able to use techniques and instruments as well as understanding potentials of their uses and applications. |
| A3   | Skills of understanding the functioning of cells through the structural organization, biochemistry, gene expression and genetic variability.   |
| A4   | Skills to apply molecular techniques to the study of the plant cell physiology, its response to external triggers and their biotechnological applications.   |
| A5   | Skills of understanding the microorganisms' role as pathogenic agents and as biotechnological tools.   |
| A8   | Skills of having an integrated view of the previously acquired knowledge about Molecular and Cellular Biology and Genetics, with an interdisciplinary approach and experimental work.                                    |
| A9   | Skills of understanding the structure and dynamics of proteins to individual and proteomic level, as well as the techniques that are necessary to analyze them and to study their interactions with other biomolecules.  |
| A10  | Skills of modifying genes, proteins and chromosomes with biotechnological applications   |
| A12  | Skills to understand, detect and analyze the genetic variation, knowing genotoxicity processes and methodologies for its evaluation, as well as carrying out diagnosis and genetic risk studies.                         |
| A13  | Skills to become a professional in health, pharmacy, veterinary, animal production, biotechnology or food sectors.   |
| B1   | Analysis skills to understand biological problems in connection with the Molecular and Cellular Biology and Genetics.  |
| B2   | Skills of decision making for the problem solving: that are able to apply theoretical knowledges and practical acquired in the formulation of biological problems and the looking for solutions.                         |
| B3   | Skills of management of the information: that are able to gather and to understand relevant information and results, obtaining conclusions and to prepare reasoned reports on scientific and biotechnological questions  |
| B4   | Organization and work planning skills: that are able to manage the use of the time as well as available resources and to organize the work in the laboratory.  |
| C1   | Ability to express oneself correctly, both orally and in writing, in the official languages of the autonomous community  |
| C3   | Using ICT in working contexts and lifelong learning.   |
| C6   | Acquiring skills for healthy lifestyles, and healthy habits and routines.  |
| C8   | Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society.   |
| C9   | Ability to manage times and resources: developing plans, prioritizing activities, identifying critical points, establishing goals and accomplishing them.  |



| Learning outcomes   |   |                   |                                 |
|---|---|-------------------|---------------------------------|
| Learning outcomes   | Study programme competences               |                   |                                 |
| Handle the necessary equipment for cellular and molecular techniques.   | AR1<br>AR2<br>AR3<br>AR4                  |                   |                                 |
| Know the protocols used for the different techniques.   | AR1<br>AR2<br>AR4<br>AR5                  |                   |                                 |
| Know the applications for the different techniques.   | AR2<br>AR4<br>AR5<br>AR10<br>AR12<br>AR13 | BR2               | CC6                             |
| Consider the ways to resolve the methodological problems associated with the performance of the techniques.   | AR8                                       | BR1<br>BR2<br>BR3 |                                 |
| Establish the relationships between the different techniques used and its possible combination to resolve the problems.   | AR8<br>AR9<br>AR10                        | BR1<br>BR2<br>BR3 |                                 |
| Interpret data from observations and measurements in the laboratory.  |   | BR2<br>BR3        | CC3                             |
| Plan, design and conduct experiments related with the techniques learned.   | AR9<br>AR10<br>AR12<br>AR13               | BR2<br>BR4        | CC3<br>CC8<br>CC9               |
| Maintain a critical attitude for a perfect experimental work.   |   |                   | CC1<br>CC3<br>CC6<br>CC8<br>CC9 |
| Relate the chemical and structural properties of biomolecules with laboratory techniques that are most suitable for isolation, purification and characterization. | AR2<br>AR9                                | BR1<br>BR2        |                                 |
| Know in depth the possibilities and characteristics of PCR and real-time PCR.   | AR1<br>AR10                               | BR3<br>BR4        |                                 |
| Understand and handle the techniques of recombinant DNA that can be used for analysis and manipulation of biomolecules.   | AR1<br>AR2<br>AR8<br>AR10                 | BR2               |                                 |
| Use methods and techniques to detect and analyze genetic variation.   | AR2<br>AR3<br>AR12                        | BR3               |                                 |

| Contents |           |
|----------|-----------|
| Topic    | Sub-topic |



|                                |  |
|--------------------------------|--|
| Purification of Biomolecules   | <p>Principle of centrifugation technique and instrumentation. Preparative and Analytical Centrifugation.</p> <p>Chromatographic Techniques: principle and selection criteria.</p> <p>Electrophoresis: principle and types. Isoelectric focusing technique. Capillary electrophoresis.</p>  |
| PCR                            | <p>Advanced concepts in PCR</p> <p>Differences between PCR and Real-time PCR</p> <p>Detection methods of amplicons</p> <p>Trial design and results analysis</p>  |
| Tecnology of molecular markers | <p>Molecular markers: definition and main characteristics</p> <p>Basic principles, development and genotyping of RFLPs, microsatellites and SNPs</p>   |
| Recombinant DNA                | <p>Enzymes and protocols used in recombinant DNA techniques</p> <p>Genomics GeneBank</p> <p>Expression GeneBank</p> <p>GeneBank analysis</p> <p>Transfer and Blotting techniques</p> <p>Sequencing techniques</p> <p>Site-direct mutagenesis techniques</p> <p>Silencing techniques</p> <p>Transgenic organisms: uses and applications</p> |

| Planning  |                                    |                      |                               |             |
|---|------------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests   | Competencies                       | Ordinary class hours | Student's personal work hours | Total hours |
| Guest lecture / keynote speech  | A2 A1 A3 A4 A5 A8<br>A10 A13 C1 C3 | 14                   | 14                            | 28          |
| Laboratory practice   | A2 A1 A3 A12 B4 C8<br>C9           | 24                   | 48                            | 72          |
| Supervised projects   | A2 A3 A8 A9 B1 B3<br>B2            | 0                    | 42                            | 42          |
| Mixed objective/subjective test   | A2 A3 A9 A12 B1 B2<br>C6           | 2                    | 4                             | 6           |
| Personalized attention  |                                    | 2                    | 0                             | 2           |
| (*)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  | By the Professors or/and by the exhibition of student work   |
| Laboratory practice             | Practical classes in the laboratory; Problem solving and practical cases   |
| Supervised projects             | Research Project related with the techniques performed in the laboratory. It will be developed individually under the Professor's supervision. |
| Mixed objective/subjective test | Exam about theoretical and practical subjects.   |

| Personalized attention |             |
|------------------------|-------------|
| Methodologies          | Description |



|                     |   |
|---------------------|---|
| Supervised projects | Personalized tutoring focused on guidance to help the students: resolving doubts and clarifications.                      |
| Guest lecture /     |   |
| keynote speech      | The tutoring schedule will be indicated the first class by each Professor. The students may request an appointment and/or |
| Laboratory practice | resolving doubts by e-mail.   |

| Assessment                      |                          |  |               |
|---------------------------------|--------------------------|--|---------------|
| Methodologies                   | Competencies             | Description  | Qualification |
| Supervised projects             | A2 A3 A8 A9 B1 B3<br>B2  | Elaboration and writing of a supervised work.  | 30            |
| Laboratory practice             | A2 A1 A3 A12 B4 C8<br>C9 | Along the practical classes, the students will answer questions and problems, which will be part of the continuous evaluation of the course. | 20            |
| Mixed objective/subjective test | A2 A3 A9 A12 B1 B2<br>C6 | Exam with questions in which the student must apply the knowledge and skills acquired along the course.                                      | 50            |

| Assessment comments  |
|--|
| <ul style="list-style-type: none"> <li>- The attendance to Practical clases is a necessary condition to be evaluated.</li> <li>- The qualifications obtained with the Supervised Project and Practical Exercises will be maintained for the 2nd Option (July) if the student do not pass the Final Exam in the 1st Option (January), and in the Final Qualification Records (QRs) will appear the qualification of - According to the rule of qualifications and records in Grades and Masters, the Quality Committee of the Faculty of Sciences, agreed to the recommendation to concede the ?Honors Qualification? to those students who obtained the highest marks in the 1st Option_June.</li> <li>-The students that do not show up in any of the two official examination dates will obtain a NOT PRESENTED in the Final Grades (ACTAS). - in the case of the fraudulent performance of tests or evaluation activities, UDC regulations will be applied</li> </ul> |

| Sources of information |   |
|------------------------|---|
| <b>Basic</b>           | <ul style="list-style-type: none"> <li>- M. L. Marina, A. Ríos, M. Valcárcel (2005). Analysis and detection by capillary electrophoresis . Amsterdam : Elsevier</li> <li>- Westermeier, Reiner. (2005). Electrophoresis in practice : a guide to methods and applications of DNA and protein separations. Weinheim : Wiley-VCH</li> <li>- Weiner MP, Gabriel SB, Stephens JC, (2007). Genetic variation: a laboratory manual. Cold Spring harbor Laboratory Press, New York.</li> <li>- Brown TA (2008). Genomes (3º ed). . Médica Panamericana, Buenos Aires.</li> <li>- Morteza G. Khaledi (1998). High-performance capillary electrophoresis theory, techniques, and applications . New York : John Wiley &amp; Sons,</li> <li>- Nuez F, Carrillo JM, (2000). Los marcadores genéticos en la mejora vegetal.. Universidad Politécnica de Valencia.</li> <li>- Avise CJ (2004). Molecular markers, natural history, and evolution (2ª ed.). . Sinauer Associates, Sunderland, MA.</li> <li>- Keith Wilson and John Walker (1995). Principles and Techniques of Practical Biochemistry. Cambridge, University Press</li> <li>- Dorak, T. (2007). Real-Time PCR. Routledge Taylor and Francis.</li> <li>- Mackay, I. M. (2007). Real-time PCR in microbiology : from diagnosis to characterisation. Norfolk: Caister Academic Press.</li> <li>- Edwards, K., Logan J. &amp; Saunders, N. (2004). Real-time PCR: an essential guide.. Horizon bioscience.</li> <li>- Logan J, Edawards K, Saunders N. (2009). Real-Time PCR: Current Technology and applications.. Caister Academic Press</li> </ul> |



|                      |   |
|----------------------|---|
| <b>Complementary</b> | Ademais, proporcionaranse artigos científicos de revisión sobre os temas tratados na asignatura na plataforma Campus Virtual. |
|----------------------|---|

## Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

## Other comments

Green Campus Faculty of Science ProgramTo help achieve an immediate sustainable environment and with point 6 of the "Environmental Declaration of the Faculty of Sciences (2020)", the work carried out in this area:a. They will be made in virtual format and computer support.b. If they will be made on paper:- Plastics will not be used.- Double-sided prints will be made.- Recycled paper will be used.- Drafts will be avoided.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.