



| Teaching Guide      |   |        |  |         |
|---------------------|---|--------|--|---------|
| Identifying Data    |   |        |  | 2019/20 |
| Subject (*)         | Biochemistry and Molecular Biology  | Code   | 610G02013  |         |
| Study programme     | Grao en Bioloxía  |        |  |         |
| Descriptors         |   |        |  |         |
| Cycle               | Period  | Year   | Type   | Credits |
| Graduate            | 2nd four-month period   | Third  | Obligatory   | 6       |
| Language            | SpanishEnglish  |        |  |         |
| Teaching method     | Face-to-face  |        |  |         |
| Prerequisites       |   |        |  |         |
| Department          | Bioloxía  |        |  |         |
| Coordinador         | Rodriguez Belmonte, Esther  | E-mail | esther.belmonte@udc.es   |         |
| Lecturers           | Freire Picos, María Ángeles<br>Rodriguez Belmonte, Esther<br>Rodriguez Torres, Ana Maria<br>Vizoso Vázquez, Ángel José  | E-mail | maria.freirep@udc.es<br>esther.belmonte@udc.es<br>ana.rodriguez.torres@udc.es<br>a.vizoso@udc.es |         |
| Web                 | ciencias.udc.es/bcm   |        |  |         |
| General description | Biochemistry and Molecular Biology include the study of the life to the level of the molecules involved in it and the interactions between them. Now a days, those studies are the base of a lot of investigations (from the biomedical area to the molecular aspects applied to the study of natural populations, agricultural applications, environmental, etc). This course will cover the basic molecular aspects of life as mRNA and protein synthesis or the gene expression regulation mediated by signal transduction systems. This course, at the 3rd level of the Biology Degree, aims to increase the student?s knowledges in this area as to develop his capacity to relate information and apply it in the resolution of different practical cases as well as experiment proposals or small research projects. |        |  |         |

| Study programme competences / results |  |
|---------------------------------------|--|
| Code                                  | Study programme competences / results  |
| A8                                    | Illar, analizar e identificar biomoléculas.  |
| A12                                   | Manipular material xenético, realizar análises xenéticas e levar a cabo asesoramento xenético. |
| A17                                   | Realizar bioensaio e diagnósticos biolóxicos.  |
| A27                                   | Dirixir, redactar e executar proxectos en Bioloxía.  |
| 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.  |
| B4                                    | Traballar de forma autónoma con iniciativa.  |
| B5                                    | Traballar en colaboración.   |
| B7                                    | Comunicarse de maneira efectiva nunha contorna de traballo.                                    |
| 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 / results |
|                   |                                       |



|  |     |     |
|--|-----|-----|
| <p>The approach of the Master Classes is to improve the knowledge and the ability of reflection on a discipline that also, once in the professional field, will demand a good praxis and adhere to ethical principles. The Laboratory Classes are more focused on the expertise on know how to do and how to be, related to the field of the Biochemistry and Molecular Biology.</p> | A8  | B1  |
|  | A12 | B2  |
|  | A17 | B3  |
|  | A27 | B4  |
|  | A29 | B5  |
|  | A30 | B7  |
|  | A31 | B10 |
|  |     | B11 |
|  |     | B13 |

| Contents  |  |
|---|--|
| Topic   | Sub-topic  |
| 1.-Basal Transcription  | RNA polymerases, core promoter and general transcription factors. Transcription mechanism: initiation, elongation and termination. Methodology to study: transcription start site selection, transcriptional termination and interactions nucleic acids-proteins.                                  |
| 2.-Regulated transcription and chromatin involvement in transcriptional regulation    | Activators and repressors. DNA binding domains: DNA-proteins interactions. Chromatin remodeling complexes. Acetylation, deacetylation and other histones modifications in the regulation of gene expression. Techniques to study transcriptional regulation. Regulation examples of specific genes |
| 3.-RNA processing and coordination of co-transcriptional events in eukaryotes         | RNA cleavage and polyadenylation. RNA splicing. Processing of ribosomic and transferent RNA  |
| 4.-RNA as regulator of gene expression  | RNA edition. Control of mRNA quality. Function of snRNA and transcriptional regulation. sncRNAs and the gene silencing mechanism. Antisense RNA in the translational regulation and applications of RNA. RNomics aspects   |
| 5.-Protein Translation  | General aspects. Ribosomes. Translation mechanism: Initiation, elongation and termination. Differences in eukaryotes. Translation in mitochondria. Translational inhibitors.   |
| 6.-Protein Processing   | Postranslational modifications of proteins. Folding: Chaperones and Prions. Ubiquitination and SUMOylation. Programed degradation: Proteasome  |
| 7.-Protein Transport  | Cotranslational and postranslational translocation. Classification and distribution of new synthesized proteins. Traffic nucleo-cytoplasm. Transport regulation and final destiny of proteins in the cell.   |
| 8.-Basics of Cell Signaling   | Classification of intercellular communication. Stages of intracellular signaling. Organization of signaling and pathways. Signaling molecules: types and functions.  |
| 9.- Reception of external signals and intracellular transduction                      | Membrane and intracellular receptors: types and mechanisms of activation. Intercellular Messenger substances or Second Messengers, protein kinase cascades and signal transduction to nucleus.   |
| 10.- Examples of control mechanisms and coordination of cell physiological activities | Cell Growth and Proliferation: regulation of cell cycle, apoptosis and cancer. Cell Senescence Signaling.  |

| Planning              |                        |                                      |                               |             |
|-----------------------|------------------------|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests | Competencies / Results | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
|                       |                        |                                      |                               |             |



|                                 |  |     |      |      |
|---------------------------------|--|-----|------|------|
| Laboratory practice             | A8 A12 A17 A27 A30<br>A31 B1 B2 B3 B4 B5<br>B7 B10 B13 | 15  | 22.5 | 37.5 |
| Problem solving                 | A29 B1 B2 B3 B4 B5<br>B7 B10 B11 B13                   | 7   | 14   | 21   |
| Guest lecture / keynote speech  | A29 B2 B3 B4 B7 B10<br>B11 B13                         | 24  | 60   | 84   |
| Document analysis               | A29 B1 B3 B5 B7 B10<br>B11 B13                         | 1   | 2    | 3    |
| Mixed objective/subjective test | A29 B2 B3 B7 B10<br>B13                                | 2.5 | 0    | 2.5  |
| 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   |
| Laboratory practice             | Focused on the study of gene expression, with the use of databases, with the analysis of reporter genes expression and/or with the study of protein expression.                                       |
| Problem solving                 | This section will include the approach and resolution of problems of different aspects in small groups of students, combining the methodologies of problem-based learning and collaborative work.     |
| Guest lecture / keynote speech  | Oral Presentation complemented with audiovisual media to transmit knowledges and provide the learning. Besides it will improve the participation of the students.                                     |
| Document analysis               | Read and comprehension of research papers.  |
| Mixed objective/subjective test | It will be used for the evaluation of the knowledge, skills, attitudes, and so, acquired by the student along the course, and will include different types of questions: multiple answer, short, etc. |

| Personalized attention  |  |
|---|--|
| Methodologies   | Description  |
| Laboratory practice<br>Problem solving<br>Guest lecture / keynote speech<br>Document analysis | The tasks to perform by the student will be guided by the Professor. It is important the regular attendance to Tutorials with the Professor, who will help to monitor the progress of the students.<br><br>The specific tutorial Schedule for students will be given at the beginning of the course. Apart from that, students can e-mail the professors to solve specific questions or to make tutorial appointments. |

| Assessment                      |  |  |               |
|---------------------------------|--|--|---------------|
| Methodologies                   | Competencies / Results                                 | Description  | Qualification |
| Laboratory practice             | A8 A12 A17 A27 A30<br>A31 B1 B2 B3 B4 B5<br>B7 B10 B13 | LABORATORY CLASSES: The assistance is mandatory. The students will interpret the obtained results. Besides they will present a work that will include a small research project based on the results in the practical course. | 20            |
| Mixed objective/subjective test | A29 B2 B3 B7 B10<br>B13                                | FINAL EXAMINATION: The knowledges obtained by the students in the Master and Small Group Classes will be evaluated in a final exam.  | 50            |
| Problem solving                 | A29 B1 B2 B3 B4 B5<br>B7 B10 B11 B13                   | Resolution of problems, student's work in Small Groups: seminars and possibility of small exams.   | 22.5          |



|                   |                                |   |     |
|-------------------|--------------------------------|---|-----|
| Document analysis | A29 B1 B3 B5 B7 B10<br>B11 B13 | Small group activity: Activity of searching and handling of scientific information that will be used to elaborate activities of science dissemination, with a class exposition in small groups, and with an ending debate. The scientific rigor of information (group work), the quality of visual presentation (group work), the fluidity and clarity of oral exposure (individual work) and responsiveness (individual work) will be evaluated. | 7.5 |
|-------------------|--------------------------------|---|-----|

### Assessment comments

- In order to add all the qualifications and pass this subject it will be mandatory to acquire the minimum scores in the three evaluable parts **INDEPENDENTLY**: Activities (Problem solving / Document analysis), Practical Classes in the Laboratory and Objective Probe (or Final Examination).

- For Final Qualifications or ACTAS (on any of the 2 opportunities, JUNE or JULY): The marks of the Objective Probe, Laboratory Practices, and Seminars will be added only if all of them reach 45% of their value. If this percentage is not reached, the final grade that will appear in ACTAS will be 4.

-In the Final Exam of the 2nd Opportunity\_(July), the student will be able to recover only the theoretical. It will not be an exam for the Practical Part in this 2º Opportunity.

-The attendance to Practical Laboratory Classes is a mandatory condition to be evaluated. Failure to attend classes without a properly justified reason means failing the subject. The students who had passed the Practical Part in the two previous academic years may apply for a request for his validation as overcome (PASS).

- 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).

-According to the rule of qualifications and records in Degrees 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 Opportunity.

-For students with part-time dedication or with an exemption of class assistance, in June and July, there will be a specific exam for overall assessment.

- Exceptionally, in the case of those students that, for duly justified reasons, are not able to perform all continuous assessment tests or evaluable activities, the professors will take their deems for appropriate measures.

### Sources of information

|              |   |
|--------------|---|
| <b>Basic</b> | <ul style="list-style-type: none"> <li>- Meister G. (2011). RNA Biology. Wiley-VHH</li> <li>- Lodish, Berk, Krieger, Kaiser et al., (2013). Molecular Cell Biology. WhFreeman</li> <li>- Herráez, A. (2012). Texto ilustrado de Biología Molecular e ingeniería genética. Elsevier</li> <li>- Lodish, Berk, Matsudaria, Kaiser et al., (2008). Biología Celular y Molecular. Ed. Médica Panamericana</li> <li>- Lewin B. (2011). Genes X. Jones and Bartlett Publishers, LLC</li> <li>- Elliot, W.H. &amp; Elliot, D.C. (2002). Bioquímica y Biología Molecular. Ariel, S.A.</li> <li>- Whitford, D. (2005). Proteins: Structure and Function. John Wiley &amp; Sons, Ltd.</li> <li>- Bruce, Alberts [et al.]. (2008). Molecular biology of the cell. New York : Garland Science, 5th ed.</li> <li>- Karp G. (2011). Biología Celular y Molecular. Conceptos y experimentos. McGraw-Hill Interamericana Eds., S.A. de C.V., traducción de la 6ª ed. de Cell and Molecular Biology</li> <li>- Stryer, L., Berg, J.M. &amp; Tymoczko, J.L. (2013). Bioquímica: con aplicaciones clínicas. Ed. Reverté, 7ª Ed.</li> <li>-Na plataforma Moodle incluiránse enlaces a páxinas web relacionadas cos diferentes contidos dos temas.</li> </ul> |
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|----------------------|---|
| <b>Complementary</b> | <ul style="list-style-type: none"><li>- Rhoads R. (2010). miRNA Regulation of the translational machinery. Springer</li><li>- Dalbey, R.E. &amp; von Heijne, G. (2002). Protein targeting, transport &amp; translocation. Academic Press</li><li>- Meyers, R.A. (2007). Proteins: from analytical to structural genomics (Volume I and II). Wiley-VCH Verlag GmbH &amp; Co.</li><li>- Krauss, Gerhard. (2008). Biochemistry of signal transduction and regulation.. Weinheim : Wiley-VCH. 2nd ed.</li></ul> |
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## Recommendations

### Subjects that it is recommended to have taken before

Bioquímica I/610212101  
Bioquímica II/610212202  
Molecular Genetics/610G02020

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

Fundamentos Bioquímicos de Biotecnología/610212620

### Other comments

.-It is recommended to attend both group and individual tutoring to get best results.

(\*)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.