| Teaching Guide | | | | |
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| Identifying Data | | | | 2023/24 |
| Subject (*) | Recombinant proteins and protein Engineering | | Code | 610441013s |
| Study programme | Máster Universitario en Bioloxía Molecular, Celular e Xenética (semipresencial) | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Official Master's Degree | 2nd four-month period | First | Optional | 3 |
| Language | Spanish | | | |
| Teaching method | Hybrid | | | |
| Prerequisites | | | | |
| Department | Bioloxía | | | |
| Coordinador | Gonzalez Siso, Maria Isabel | E-mail | isabel.gsiso@udc.es | |
| Lecturers | Becerra Fernandez, Manuel<br>Gonzalez Siso, Maria Isabel<br>Vizoso Vázquez, Ángel José | E-mail | manuel.becerra@udc.es<br>isabel.gsiso@udc.es<br>a.vizoso@udc.es | |
| Web | | | | |
| General description | The current importance of enzymatic processes applied to the food and drug industry allows the production of compounds that could not obtain by any other way. Industrial production of enzymes is a business that at the beginning of the 21st century moves around 1600 million of dollars a year. The use of enzymes in industrial processes is often limited by factors inherent to the nature of enzymes as for example a lack of stability in extreme conditions of temperature or pH, denaturation in presence of organic solvents or poor activity against certain substrates. Currently, there are a wide range of techniques of expression and engineering of proteins that allow the generation of modified proteins in order to overcome these limitations. There are a wide range of products developed by these pathways that are used in various fields. This course will describe current methods for expression and modification of proteins, both in basic research and biotechnological applications. | | | |

| Study programme competences | |
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| 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. |
| A10 | Skills of modifying genes, proteins and chromosomes with biotechnological applications |
| 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 |
| B7 | Personal progress skills : that are able to learn from freelance way, adapting to new situations, developing necessary qualities as the creativity, skills of leadership, motivation for the excellence and the quality. |
| C2 | Ability to know and use appropriately the technical terminology of the field of knowledge of the master, in the native language and in English, as a language of international diffusion in this field |
| C3 | Using ICT in working contexts and lifelong learning. |
| C8 | Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society. |

| Learning outcomes | | | |
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| Learning outcomes | Study programme competences | | |
| Ability to learn and use biochemical concepts, techniques and resources available in databases related to the subject | AR1<br>AR2<br>AR10 | BR3<br>BR7 | CC2<br>CC3<br>CC8 |
| Ability to solve practical cases through the acquisition of skills that allow to carry out a simulated project of expression of recombinant proteins and directed evolution of proteins. | AR1<br>AR2<br>AR10 | BR3<br>BR7 | CC2<br>CC3<br>CC8 |

| Contents | |
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| **Topic** | **Sub-topic** |
| Systems for expresión of native and recombinant proteins: bacterias | Systems of expression of Heterologous proteins in bacteria and purification. |
| Systems for expresión of native and recombinant proteins: yeasts | Systems of expression of Heterologous proteins in yeast and down-stream processing. |
| Systems for expresión of native and recombinant proteins: animal cells | Genetic manipulation of animal cells. Systems of expression and production of proteins in mammalian cells. |
| Protein engineering I | Introduction. Site-directed mutagenesis techniques. |
| Protein engineering II | Techniques of artificial evolution of proteins. |
| Protein engineering III | Techniques of stabilization and immobilization of enzymes. |
| Industrial applications of protein engineering | Applications in Enzymology, pharmaceutical, food industry and other applications. |

| Planning | | | | |
|---|---|---|---|---|
| **Methodologies / tests** | **Competencies** | **Ordinary class hours** | **Student?s personal work hours** | **Total hours** |
| Workbook | A1 A2 A10 B3 B7 C2 C3 C8 | 1 | 13 | 14 |
| Case study | A1 A2 A10 B3 B7 C2 C3 C8 | 1 | 20 | 21 |
| Directed discussion | A1 A2 A10 B3 B7 C2 C3 C8 | 1 | 20 | 21 |
| Mixed objective/subjective test | B3 B7 C2 C3 C8 | 2 | 12 | 14 |
| Personalized attention | | 5 | 0 | 5 |
| **(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.** | | | | |

| Methodologies | |
|---|---|
| **Methodologies** | **Description** |
| Workbook | Methodology that allows students to learn through consultations of the materials available at their disposal on the virtual campus such as notes, recorded classes, presentations, scientific papers, etc. |
| Case study | A methodology that allows students to learn effectively through resolution of practical cases. |
| Directed discussion | Technique of group dynamics in which the members of a group discussed free, informal and spontaneous way on a subject, coordinated by a moderator. |
| Mixed objective/subjective test | Exam comprising questions type of testing trial, questions objective type testing and resolution of cases and problems. |

| Personalized attention | |
|---|---|
| **Methodologies** | **Description** |
| Directed discussion<br>Case study<br>Mixed objective/subjective test<br>Workbook | The directed discussion is conceived as moments of face-to-face student work with the teacher by involving compulsory student participation. |

| Assessment | | | |
|---|---|---|---|
| **Methodologies** | **Competencies** | **Description** | **Qualification** |

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|---|---|---|---|
| Directed discussion | A1 A2 A10 B3 B7 C2 C3 C8 | Active participation will be evaluated. The students must present the solutions to questionnaries | 20 |
| Case study | A1 A2 A10 B3 B7 C2 C3 C8 | Skill to apply the knowledge acquired to solve cases that simulate a research project in protein engineering. The students must present the solved cases. | 20 |
| Mixed objective/subjective test | B3 B7 C2 C3 C8 | Test to evaluate the knowledge acquired during the master classes, practical classes of laboratory as well as directed discussion | 60 |

| Assessment comments |
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| To get honours preference will be given to the best notes of the call of<br>June |

| Sources of information | |
|---|---|
| Basic | -Cerdán Villanueva, M. E. Curso Avanzado de Proteínas y Ácidos Nucleicos. A Coruña. Universidade da Coruña. 2005. Libro. -Cerdán Villanueva, M. E., Freire Picos, M. A., González Siso, M. I. y Rodríguez Torres, A. M., Biología Molecular. Avances y Técnicas generales , A Coruña. Universidade da Coruña, 1997, Libro. -Gerd Gellisen Ed., Production of recombinant proteins: novel microbial and eukaryotic expression systems, Weinheim: Wiley-VCH, 2005, Libro,BM-720 -Glick, B. R., Molecular Biotechnology: Principles and Application of Recombinant DNA, Washington: American Society Microbiology, 2003, Libro,BM-668 -Gómez-Moreno, C. y Sancho, J. Estructura de proteínas. Ariel Ciencia. 2003. Libro -González Siso, M. I., La Biotecnología en el tratamiento de residuos industriales , A Coruña. Universidade da Coruña. Servicio de Publicacións, 1999, Libro, - Lutz, S., Bornscheuer. Protein Engineering Handbook. Wiley-Vch. Volumen 1 y 2. 2009. Libro. BM-785 -Ninfa, A. J., Fundamental laboratory approaches for biochemistry and biotechnology, Hoboken: John Wiley and Sons, 2010, Libro,BM-801 -Perera, J., Tormo, A., García, J. L., Ingeniería Genética. Vol I. Preparación, análisis, manipulación y clonaje del DNA. , Madrid. Síntesis , 2002, Libro, -Perera, J., Tormo, A., García, J. L., Ingeniería Genética. Vol II. Expresión de DNA en sistemas heterólogos., Madrid. Síntesis , 2002, Libro, -Thiel, T., Bissen, S. T., Lyons, E. M., Biotechnology: DNA to Protein. A Laboratory Project in Molecular Biology. , , 2001, Libro, -Wink, M., An introduction to molecular Biotechnology: from molecular biological fundamentals to methods and applications in modern biotechnology, Verlag Chemie, GmbH, 2006, Libro,BM-762 |
| Complementary | |

| Recommendations |
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| Subjects that it is recommended to have taken before |
| Molecular Techniques/610441002 |
| Subjects that are recommended to be taken simultaneously |
| Protein Structure and Dynamics/610441012<br>Bioinformatics and Biomolecular models /610441021 |
| Subjects that continue the syllabus |
| Project/610441023 |
| Other comments |
| To contribute to achieving an immediate sustainable environment and comply with point 6 of the "Environmental Declaration of the Faculty of Sciences (2020)", the documentary work carried out in this area:a. They will be requested mainly in virtual format and computer support.B. To do 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.