



## Teaching Guide

| Teaching Guide                                    |                                                                                                                                                   |        |                        |           |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------|-----------|
| Identifying Data                                  |                                                                                                                                                   |        | 2021/22                |           |
| Subject (*)                                       | Neuroengineering and innovation in neuroscience                                                                                                   |        | Code                   | 614522016 |
| Study programme                                   | Mestrado Universitario en Bioinformática para Ciencias da Saúde                                                                                   |        |                        |           |
| Descriptors                                       |                                                                                                                                                   |        |                        |           |
| Cycle                                             | Period                                                                                                                                            | Year   | Type                   | Credits   |
| Official Master's Degree                          | 1st four-month period                                                                                                                             | Second | Optional               | 3         |
| Language                                          | SpanishGalician                                                                                                                                   |        |                        |           |
| Teaching method                                   | Hybrid                                                                                                                                            |        |                        |           |
| Prerequisites                                     |                                                                                                                                                   |        |                        |           |
| Department                                        | Ciencias da Computación e Tecnoloxías da InformaciónFisioterapia, Medicina e Ciencias Biomédicas                                                  |        |                        |           |
| Coordinador                                       | Rouco Maseda, Jose                                                                                                                                | E-mail | jose.rouco@udc.es      |           |
| Lecturers                                         | Cudeiro Mazaira, F.Javier                                                                                                                         | E-mail | javier.cudeiro@udc.es  |           |
|                                                   | Rivadulla Fernandez, Juan Casto                                                                                                                   |        | casto.rivadulla@udc.es |           |
|                                                   | Rouco Maseda, Jose                                                                                                                                |        | jose.rouco@udc.es      |           |
| Web                                               | moodle.udc.es                                                                                                                                     |        |                        |           |
| General description                               | The student will know the latest advances in Brain-Computer-Interface (BCI) technology and what type of data are analyzed in this type of systems |        |                        |           |
| Contingency plan                                  | 1. Modifications to the contents                                                                                                                  |        |                        |           |
|                                                   | None.                                                                                                                                             |        |                        |           |
|                                                   | 2. Methodologies                                                                                                                                  |        |                        |           |
|                                                   | *Teaching methodologies that are maintained                                                                                                       |        |                        |           |
|                                                   | All of them.                                                                                                                                      |        |                        |           |
|                                                   | *Teaching methodologies that are modified                                                                                                         |        |                        |           |
|                                                   | If necessary, all the used methodologies could be applied on a non-presential basis with the available tools (Moodle, Teams, etc.)                |        |                        |           |
|                                                   | 3. Mechanisms for personalized attention to students                                                                                              |        |                        |           |
|                                                   | Continuous attention in Teams, Moodle and email.                                                                                                  |        |                        |           |
|                                                   | 4. Modifications in the evaluation                                                                                                                |        |                        |           |
| Not necessary.                                    |                                                                                                                                                   |        |                        |           |
| *Evaluation observations:                         |                                                                                                                                                   |        |                        |           |
| None.                                             |                                                                                                                                                   |        |                        |           |
| 5. Modifications to the bibliography or webgraphy |                                                                                                                                                   |        |                        |           |
| None.                                             |                                                                                                                                                   |        |                        |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                         |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1   | CE1 - Ability to know the scope of Bioinformatics and its most important aspects                                                                                                                    |
| A2   | CE2 ? To define, evaluate and select the architecture and the most suitable software for solving a problem in the field of bioinformatics                                                           |
| A3   | CE3 ? To analyze, design, develop, implement, verify and document efficient software solutions based on an adequate knowledge of the theories, models and techniques in the field of Bioinformatics |
| A7   | CE7 - Ability to identify the applicability of the use of bioinformatics tools to clinical areas.                                                                                                   |



|    |                                                                                                                                                                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B1 | CB6 - Own and understand knowledge that can provide a base or opportunity to be original in the development and/or application of ideas, often in a context of research                                                                                                           |
| B2 | CB7 - Students should know how to apply the acquired knowledge and ability to problem solving in new environments or little known within broad (or multidisciplinary) contexts related to their field of study                                                                    |
| B3 | CB8 - Students to be able to integrate knowledge and deal with the complexity of making judgements from information that could be incomplete or limited, including reflections on the social and ethical responsibilities linked to the application of their skills and judgments |
| B4 | CB9 - Students should know how to communicate their findings, knowledge and latest reasons underpinning them to specialized and non-specialized audiences in a clear and unambiguous way                                                                                          |
| B5 | CB10 - Students should possess learning skills that allow them to continue studying in a way that will largely be self-directed or autonomous.                                                                                                                                    |
| B6 | CG1 - Search for and select the useful information needed to solve complex problems, driving fluently bibliographical sources for the field                                                                                                                                       |
| B7 | CG2 - Maintain and extend well-founded theoretical approaches to enable the introduction and exploitation of new and advanced technologies                                                                                                                                        |
| B8 | CG3 - Be able to work in a team, especially of interdisciplinary nature                                                                                                                                                                                                           |
| C1 | CT1 - Express oneself correctly, both orally writing, in the official languages of the autonomous community                                                                                                                                                                       |
| C3 | CT3 - Use the basic tools of the information technology and communications (ICT) necessary for the exercise of their profession and lifelong learning                                                                                                                             |
| C6 | CT6 - To assess critically the knowledge, technology and information available to solve the problems they face to.                                                                                                                                                                |
| C7 | CT7 ? To maintain and establish strategies for scientific updating as a criterion for professional improvement.                                                                                                                                                                   |
| C8 | CT8 - Rating the importance that has the research, innovation and technological development in the socio-economic and cultural progress of society                                                                                                                                |

| Learning outcomes                                                                                                                                                           |                             |                          |                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------|-------------------|
| Learning outcomes                                                                                                                                                           | Study programme competences |                          |                   |
| Coñecer as distintas técnicas de estimulación cerebral non invasiva e a súa aplicación Neurociencia e ser capaz de valorar críticamente as súas contribucións e limitacións | AJ1<br>AJ7                  | BJ1<br>BJ5<br>BJ8        | CJ1               |
| Comprender o funcionamento do cerebro baixo a orientación de buscar alternativas para a súa exploración e estimulación.                                                     | AJ3                         | BJ6<br>BJ7               |                   |
| Entender o funcionamento das interfaces avanzadas Cerebro-Computador; Fundamentos, etapas, aplicacións.                                                                     | AJ1<br>AJ2<br>AJ3<br>AJ7    | BJ1<br>BJ2<br>BJ3<br>BJ4 | CJ3<br>CJ7        |
| Comprender estratexias de axuda aos sentidos e ao movemento mediante a estimulación cerebral utilizando solucións integradas de enxeñaría.                                  | AJ1<br>AJ7                  | BJ2<br>BJ4               | CJ6<br>CJ8        |
| Caracterización de patróns e eventos asociados a cambios de estado no cerebro.                                                                                              | AJ2<br>AJ7                  |                          | CJ1<br>CJ6<br>CJ7 |
| Comprender e saber explotar solucións integradoras da enxeñaría no ámbito neurolóxico co fin de mellorar as actividades da vida diaria en colectivos dependentes            | AJ3                         | BJ3<br>BJ4               | CJ7               |

| Contents                                                                                                                                        |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Topic                                                                                                                                           | Sub-topic |
| Tema 1. Unha ventá ao cerebro: Novas Tecnoloxías na exploración e estimulación cerebral.                                                        | .         |
| Tema 2. Interfaces Home-Máquina (Brain-Computer).<br>Procesos, caracterización, avaliación de variables, recoñecemento de patróns, aprendizaxe. |           |



|                                                                                                    |  |
|----------------------------------------------------------------------------------------------------|--|
| Tema 3. Neuroenxeñaría, prótese e interfaces<br>home-máquina: axudando ao movemento e aos sentidos |  |
| Tema 4. Análise para a detección de cambios de estado do<br>cerebro: predicción de eventos.        |  |

| Planning                                                                                                                        |                               |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies                  | Ordinary class hours | Student's personal work hours | Total hours |
| Problem solving                                                                                                                 | A3 B1 B3 B5 B6 B8<br>C3 C6    | 8                    | 16                            | 24          |
| Oral presentation                                                                                                               | A1 B1 B4 B5 C1 C3<br>C6 C7 C8 | 2                    | 10                            | 12          |
| Events academic / information                                                                                                   | A1 A7 B3 B4                   | 2                    | 2                             | 4           |
| Objective test                                                                                                                  | A1 A3 B1 B2 B4 C1             | 2                    | 16                            | 18          |
| Guest lecture / keynote speech                                                                                                  | A1 A2 A3 A7 B1 B2<br>B7 C6    | 7                    | 7                             | 14          |
| Personalized attention                                                                                                          |                               | 3                    | 0                             | 3           |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |                               |                      |                               |             |

| Methodologies                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Problem solving                | Técnica mediante a que se ten que resolver unha situación problemática concreta, a partir dos coñecementos que se traballaron, que pode ter máis dunha posible solución.                                                                                                                                                                                                                                                                                                                                                                                                  |
| Oral presentation              | Intervención inherente aos procesos de ensino-aprendizaxe baseada na exposición verbal a través da que o alumnado e profesorado interactúan dun modo ordenado, propoñendo cuestións, facendo aclaracións e expoñendo temas, traballos, conceptos, feitos ou principios de forma dinámica.                                                                                                                                                                                                                                                                                 |
| Events academic / information  | Actividades realizadas polo alumnado que implican a asistencia e/ou participación en eventos científicos e/ou divulgativos (congresos, xornadas, simposios, cursos, seminarios, conferencias, exposicións, etc.) co obxectivo de profundar no coñecemento de temas de estudo relacionados coa materia. Estas actividades proporcionan ao alumnado coñecementos e experiencias actuais que incorporan as últimas novidades referentes a un determinado ámbito de estudo.                                                                                                   |
| Objective test                 | Examen sobre os contidos da materia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Guest lecture / keynote speech | Exposición oral complementada co uso de medios audiovisuais e a introdución de algunhas preguntas dirixidas aos estudantes, coa finalidade de transmitir coñecementos e facilitar a aprendizaxe.<br>A clase maxistral é tamén coñecida como ?conferencia?, ?método expositivo? ou ?lección maxistral?. Esta última modalidade sóese reservar a un tipo especial de lección impartida por un profesor en ocasións especiais, cun contido que supón unha elaboración orixinal e baseada no uso case exclusivo da palabra como vía de transmisión da información á audiencia |

| Personalized attention |                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                               |
| Oral presentation      | O estudante terá apoio a través de tutorías personalizadas durante o proceso de preparación da exposición |

| Assessment        |                               |                                                                                     |               |
|-------------------|-------------------------------|-------------------------------------------------------------------------------------|---------------|
| Methodologies     | Competencies                  | Description                                                                         | Qualification |
| Oral presentation | A1 B1 B4 B5 C1 C3<br>C6 C7 C8 | Grado de elaboración da proposta<br>Claridade expositiva<br>Capacidade de reflexión | 20            |
| Problem solving   | A3 B1 B3 B5 B6 B8<br>C3 C6    | Participación na aula<br>Entrega de cuadernillo                                     | 30            |



|                |                   |                             |    |
|----------------|-------------------|-----------------------------|----|
| Objective test | A1 A3 B1 B2 B4 C1 | Avaliación dos coñecementos | 50 |
|----------------|-------------------|-----------------------------|----|

## Assessment comments

## Sources of information

|               |  |
|---------------|--|
| Basic         |  |
| Complementary |  |

## 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

(\*)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.