UNIVERSIDADE DA CORUÑA

| Teaching Guide | | | | |
|---|---|---|---|---|
| Identifying Data | | | | 2016/17 |
| Subject (*) | Análise de imaxes biomédicas | | Code | 614522010 |
| Study programme | Mestrado Universitario en Bioinformática para Ciencias da Saúde | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Official Master's Degree | 2nd four-month period | First | Obligatoria | 6 |
| Language | Spanish | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Computación | | | |
| Coordinador | Gonzalez Penedo, Manuel | E-mail | manuel.gpenedo@udc.es | |
| Lecturers | Barreira Rodriguez, Noelia<br>Gonzalez Penedo, Manuel<br>Novo Bujan, Jorge | E-mail | noelia.barreira@udc.es<br>manuel.gpenedo@udc.es<br>j.novo@udc.es | |
| Web | | | | |
| General description | This course presents introductory medical image processing and analysis techniques. It presents basic concepts about image processing. Topics include data acquisition, imaging, filtering, image segmentantion and registration. The focus of the course is to provide a global perspective and practical experience in the field. | | | |

| Study programme competences / results | |
|---|---|
| Code | Study programme competences / results |
| 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 |
| A4 | CE4 - Ability to acquire, obtain, formalize and represent human knowledge in a computable form for the resolution of problems through a computer system in any field of application, particularly those related to aspects of computing, perception and action in bioinformatics applications |
| A6 | CE6 - Ability to identify software tools and most relevant bioinformatics data sources, and acquire skill in their use |
| 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 |
| 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 |
| 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. |

| Learning outcomes | | | |
|---|---|---|---|
| Learning outcomes | Study programme competences / results | | |
| Understand the medical imaging modalities and their significance | AJ1 | BJ1 | |
| Understand the basic concepts of image processing | AJ4<br>AJ6 | BJ5<br>BJ6 | CJ3 |
| Design and evaluate medical analysis techniques | AJ2 | BJ2<br>BJ7 | CJ6 |

| Contents | |
|---|---|
| **Topic** | **Sub-topic** |
| Introduction to digital imaging. | Adquisition models.<br>Quality metrics.<br>Color spaces.<br>Histograms. |
| Image processing. | Enhancement.<br>Edge detection.<br>Segmentation.<br>Morphological operators. |
| Image registration and fusion. | Intensity vs features.<br>Similarity measures.<br>Multimodal methods. |
| Validation of medical image analysis methodologies | Measures for quality assessment<br>Training and testing methods<br>Statistical tests |

| Planning | | | | |
|---|---|---|---|---|
| **Methodologies / tests** | **Competencies / Results** | **Teaching hours (in-person & virtual)** | **Student?s personal work hours** | **Total hours** |
| Guest lecture / keynote speech | A1 A4 B1 | 24 | 24 | 48 |
| Laboratory practice | A2 A6 B2 B7 C3 | 16 | 40 | 56 |
| Supervised projects | B5 B6 | 4 | 28 | 32 |
| Oral presentation | C6 | 4 | 4 | 8 |
| Objective test | A1 A2 B1 B2 C6 | 3 | 0 | 3 |
| 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** |
| Guest lecture / keynote speech | Lectures with the use of audiovisual aids. Questions will be raised in order to transmit the knowledge and enforce the learning. |
| Laboratory practice | The aim is to solve common problems in medical imaging using the methods explained in the lectures. |
| Supervised projects | Students in pairs will make a project about a relevant topic in medical imaging. |
| Oral presentation | Students will present their project in the classroom. |
| Objective test | Test with questions about the theoretical contents of the subject as well as practical problems. |

| Personalized attention | |
|---|---|
| **Methodologies** | **Description** |
| Laboratory practice<br>Supervised projects | Teachers will answer the doubts during the laboratory practice and they will provide personal advising for the supervised projects. |

| Assessment | | | |
|---|---|---|---|
| **Methodologies** | **Competencies / Results** | **Description** | **Qualification** |
| Oral presentation | C6 | Comprehension of the issue. Clarity in the presentation. Preparing of additional contents to complement the explanation. | 10 |

| | | | |
|---|---|---|---|
| Laboratory practice | A2 A6 B2 B7 C3 | Suitability of the proposed solutions to the problems. Quality of the obtained results. Comprehension of the employed techniques. | 40 |
| Supervised projects | B5 B6 | Clarity in the presentation of the issue. Organization of the contents. Bibliography revision. Teamwork. | 30 |
| Objective test | A1 A2 B1 B2 C6 | Written test with theoretical questions and practical problems to be solved. | 20 |

| Assessment comments |
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| In order to pass this subject, students have to get, at least, 5 points out of 10 in laboratory practice and supervised projects.ACADEMIC EXEMPTION For all those students with half time dedication and academic exemption specific considerations will be taken. |

| Sources of information | |
|---|---|
| Basic | - Rafael C. González, Richard E. Woods (2010). Digital image processing. Upper Saddle River (New Jersey) : Pearson-Prentice Hall, [2010]<br>- Milan Sonka, Vaclav Hlavac, Roger Boyle (2014). Image processing, analysis and machine vision. Pacific Grove, California : Brooks/Cole Publishing Company, |
| Complementary | - David A. Forsyth, Jean Ponce (2012). Computer vision : a modern approach. Boston : Pearson<br>- Richard Szeliski (2010). Computer Vision: Algorithms and Applications. Springer (draft online) |

| Recommendations |
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| Subjects that it is recommended to have taken before |
| Introdución á programación/614522001 |
| Subjects that are recommended to be taken simultaneously |
| Probabilidade. estatística e elementos de biomatemática/614522007<br>Fundamentos de intelixencia artificial/614522003 |
| Subjects that continue the syllabus |
| Visualización médica avanzada/614522019 |
| Other comments |
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(*)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.