

## SUBJECT TEACHING GUIDE

G651 - Data Structures

Double Degree in Physics and Mathematics

Degree in Computer Systems Engineering

Degree in Mathematics

Academic year 2022-2023

| 1. IDENTIFYING DATA              |  |                  |                    |                  |  |
|----------------------------------|--|------------------|--------------------|------------------|--|
| Degree                           | Double Degree in Physics and Mathematics<br>Degree in Computer Systems Engineering     |                  |                    | Type and Year    | Optional. Year 5<br>Compulsory. Year 2 |
| Faculty                          | Faculty of Sciences  |                  |                    |                  |  |
| Discipline                       | Subject Area: Computer Programming<br>Mention in Computer Science<br>Compulsory Module |                  |                    |                  |  |
| Course unit title and code       | G651 - Data Structures   |                  |                    |                  |  |
| Number of ECTS credits allocated | 6  | Term             | Semester based (1) |                  |  |
| Web                              |  |                  |                    |                  |  |
| Language of instruction          | Spanish  | English Friendly | Yes                | Mode of delivery | Face-to-face                           |

|                  |   |
|------------------|---|
| Department       | DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA                                    |
| Name of lecturer | MARIO ALDEA RIVAS   |
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| Office           | Facultad de Ciencias. Planta: + 3. DESPACHO - COMPUTADORES TIEMPO REAL (3054) |
| Other lecturers  | JOSE CARLOS PALENCIA GUTIERREZ<br>JULIO LUIS MEDINA PASAJE                    |

### 3.1 LEARNING OUTCOMES

- Know the fundamentals of computer programming and of programming reasoning, including modularity and object orientation.
- To be able to correctly and effectively apply criteria for the modular decomposition of problems to a sufficient degree to complete the programming of their solution.
- Know how to apply an object oriented methodology, including class diagrams.
- Being able to choose and effectively use the most efficient data structures based on the characteristics desired for the programs in which they are used, having a wide and flexible repertoire of related concepts: chained structures, hash tables, search trees , multipath trees.
- Know the different implementation techniques of the main data structures and know how to create special data structures , adapted to specific problems.
- Know with familiarity the consequences of logarithmic, linear, quadratic, polynomial and exponential growth, and be able to assess the computational complexity of a given problem, thus explaining the behaviour in terms of execution time of a program that solves it.

### 4. OBJECTIVES

Understanding of the basics of the analysis, design, implementation, verification and testing of the most important Abstract Data Types.

Know how to use the Abstract Data Types as the base components of software applications , choosing the Abstract Data Types more appropriate to the temporal and spatial requirements of each application.

### 6. COURSE ORGANIZATION

#### CONTENTS

|   |                        |
|---|------------------------|
| 1 | Introduction           |
| 2 | Analysis of algorithms |
| 3 | Lists                  |
| 4 | Stacks and queues      |
| 5 | Trees                  |
| 6 | Maps.                  |
| 7 | Ordered ADTs.          |
| 8 | Sets                   |

### 7. ASSESSMENT METHODS AND CRITERIA

| Description   | Type                  | Final Eval. | Reassessn | %      |
|---|-----------------------|-------------|-----------|--------|
| Evaluation of the exercises performed by the students in the laboratory sessions.   | Laboratory evaluation | No          | Yes       | 15,00  |
| Laboratory evaluation. Two or more exams performed during the teaching period.  | Laboratory evaluation | No          | Yes       | 85,00  |
| TOTAL   |                       |             |           | 100,00 |
| Observations  |                       |             |           |        |
| In order to pass the subject it is compulsory to obtain the minimum grade in the Laboratory and Written evaluations (4.5).  |                       |             |           |        |
| Observations for part-time students   |                       |             |           |        |
| Part-time students do not need to attend to the Laboratory evaluations performed during the course. They can pass the subject by attending to the evaluations in the ordinary and/or extraordinary periods. |                       |             |           |        |

### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

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| BASIC  |
| Michael T. Goodrich, Roberto Tamassia, Data structures and algorithms in Java. John Wiley & Sons, 2006.  |
| Cormen, Thomas H.; Leiserson, Charles E., Rivest, Ronald L., Stein, Clifford, Introduction to Algorithms (3rd ed.). MIT Press and McGraw-Hill, 2009. |